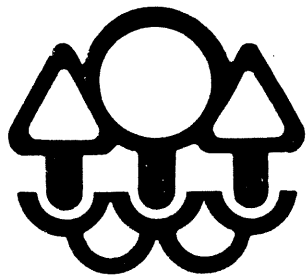


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LAKE SUPERIOR PAPERMILL PROJECT

Duluth, Minnesota
January, 1986



Minnesota
Pollution Control Agency

**DRAFT ENVIRONMENTAL IMPACT
STATEMENT**

COVER SHEET
DRAFT ENVIRONMENTAL IMPACT STATEMENT
LAKE SUPERIOR PAPER COMPANY
DULUTH PAPERMILL PROJECT

Responsible
Governmental Unit: Minnesota Pollution Control Agency (MPCA)

Project Title: Lake Superior Paper Company
Duluth Papermill

Project Location: Duluth, Minnesota, St. Louis County

Agency Contact

Person: Mr. Craig Affeldt
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Proposer: Lake Superior Paper Company
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Duluth, MN 55802
Robert Lindholm, Environmental Engineer (218) 722-2641

Abstract: The Lake Superior Paper Company, a joint venture of Minnesota Power and Pentair Inc., proposes to build a papermill in the west end of Duluth, Minnesota. The Duluth Papermill Project will involve the acquisition and removal or relocation of homes and businesses onsite and the construction of facilities for the production of 234,900 tons per year of lightweight supercalendered paper. Modifications will be made to the M.L. Hibbard Steam Electric Station to allow it to burn a wood/coal/sludge mixture to produce steam for the papermill. The project will permanently employ approximately 300 workers. Construction of the project is slated to commence in 1986 with completion in 1988. Construction costs are estimated at 274 million dollars and will involve approximately 1460 construction workers.

Public Meeting

Date: February 18, 1986

Comment Period

on the Draft EIS: Ends March 4, 1986

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CHAPTER 1

EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

This draft Environmental Impact Statement (EIS) for the proposed Lake Superior Paper Company project in Duluth was prepared by the staff of the Minnesota Pollution Control Agency (MPCA), with the assistance of the NUS Corporation, an engineering/environmental consulting firm.

This EIS is being prepared on a mandatory basis pursuant to Minnesota rules Part 4410.4400 subpart 10. Environmental review of the project began in July, 1985, with the distribution of an Environmental Assessment Worksheet (EAW). This draft EIS and the process used to prepare it comply with the Minnesota Environmental Quality Board (EQB) Environmental Review Program.

1.1 DESCRIPTION OF THE PROJECT

The proposed project will be located on 92 acres of land in the west end of the City of Duluth. The city will provide the project site through the purchase and removal or relocation of the residents or other occupants of 192 parcels, including residential, business and vacant properties. The acquisition and relocation will be in compliance with the Federal Real Estate Acquisition and Relocation Act of 1970 and State guidelines.

The project will produce 234,900 tons per year of lightweight supercalendered paper for use in newspaper inserts, catalogs and magazines. New facilities will be constructed along with construction and modification to onsite utility systems. The nearby Hibbard Steam Electric Station will be modified to burn a wood/coal/sludge mixture producing steam for papermill processes, heating, and electric generation needs. Steam will also be available to other customers.

The papermill will use 171,000 cords of spruce and balsam per year, to be harvested in northeastern Minnesota and northwestern Wisconsin. The Hibbard Station will use 60,000 cords of birch per year from Minnesota.

The project will employ approximately 300 workers in mill activities and 250 workers in related wood harvesting activities. Papermill construction will last approximately two years; peak construction employment is estimated to be 1,460. The estimated total cost of the project is 274 million dollars.

1.2 ENVIRONMENTAL IMPACTS

Environmental issues and concerns related to the project were raised during the development of the scope of the EIS. The key project issues that were incorporated into the scope of the EIS and that have been addressed in this document are:

- o Air, odor, and water quality impacts
- o Impacts of noise
- o Land use and zoning impacts
- o Traffic impacts in the project vicinity
- o Geology, soils and groundwater impacts
- o Handling and disposal of solid and hazardous waste

- o Ecological impacts
- o Socioeconomic impacts
- o Impacts of timber harvesting

The environmental effects of the project with respect to these concerns are explored in detail in the EIS and are summarized below.

1.2.1 Air Quality and Odor

During the construction phase of the project, the major impacts will include mobile source and fugitive particulate emissions associated with earth moving activities. These impacts will be short-term and localized and measures can be taken to ensure that there will be no significant air quality impact due to construction. The papermill and Hibbard Station operation will not have an adverse effect on air quality because pollutant concentrations will be less than applicable ambient standards and SO₂ PSD increments.

Odorant substances may originate from the pulping process, and the process wastewater system including the clarifier and residual sludge. The pulping process is expected to generate "woody" odors and clarifier/sludge odors are not expected to be noticeable offsite.

1.2.2 Surface Water

The project is expected to have minimal impacts upon area water quality and hydrology. Three areas of potential impact have been identified: site stormwater runoff; withdrawal of water from St. Louis Bay via the Hibbard Station intake structure; and incremental effects of the WLSSD wastewater discharge to St. Louis Bay. These potential impacts are expected to be insignificant and will be minimized through various mitigation measures. The WLSSD Advanced Wastewater Treatment Facility will continue to have excess capacity well past 1990, and will not be adversely affected by the increased flows and loadings of BOD₅/TSS.

1.2.3 Noise

Noise impacts will result from both construction and operation of the project. Construction noise will result from construction activities and traffic, but will be of relatively short duration and amenable to diurnal mitigation. Operational noise impacts will result from traffic, papermill activities, and from Hibbard Station. Noticeable increases in noise will occur in both daytime and nighttime, but only nighttime increases from all activities combined will exceed any MPCA standards.

1.2.4 Land Use

The major land use impact resulting from the project will be the removal and relocation of the existing residences, businesses, and other structures on the site. This impact, although significant, is not expected to have adverse consequences due to mitigation by an extensive relocation process and restoration of the site to productive, attractive, and locally-compatible land uses.

1.2.5 Transportation

The project will increase both truck and car traffic on surrounding roads during construction and operation. Area roads will experience some delays during construction. Police officer control will be used to minimize delays. During project operations, local roads will handle the increased traffic with little or no delays, thereby maintaining acceptable levels of service.

1.2.6 Geology, Soils and Groundwater

The project will have very little impact on site geology, soils or groundwater. Erosion control measures will be used to minimize possible erosion effects. The project will improve groundwater quality during site preparation, through the cleanup of existing sources of contamination.

1.2.7 Solid and Hazardous Waste

The project will generate solid waste streams including demolition type wastes, solid and hazardous waste uncovered during site cleanup, refuse, and wastewater sludge. Adequate capacity exists in nearby waste management facilities to handle the various waste streams. Truck traffic, leachate generation, and fugitive dust emissions from landfill operations are expected to increase due to the project. Mitigation measures will be taken to reduce these potential environmental impacts. The fully permitted action would increase ash generation from Hibbard Station compared to the proposed action, but this additional volume poses no additional significant impact.

1.2.8 Ecology

Impacts of the project on terrestrial ecosystems are expected to be minor. No unique nor critical habitats have been identified onsite. Retrofitting and operation of the Hibbard Station should not directly impact the Ring-Billed Gull colony, nesting on the plant peninsula. Direct interference by plant personnel could cause disturbance. If such disturbance occurred, the potential exists for adverse effects on the Common Tern and Piping Plover, two species listed as threatened or endangered. Direct human disturbance will be avoided during the Ring-Bill Gull nesting season.

Aquatic ecologic impacts arise mainly from the entrainment and impingement losses of fish eggs and larvae due to process water withdrawal at Hibbard Station. Operation of the Hibbard Station under the fully permitted action would generate a thermal discharge in St. Louis Bay. The effect of this discharge, along with increased fish impingement/entrainment from large cooling water withdrawals, would need to be studied to determine appropriate mitigations measures.

1.2.9 Economic and Social Conditions

Significant adverse impacts to local and regional economic and social conditions are not anticipated to result from the project. Adequate housing and services exist to handle both permanent and construction worker influxes. Property acquisition and relocation of residents and businesses are being officially handled in accordance with both federal and state procedures.

Construction and operation of the project will result in beneficial economic impacts to the local and regional economies. These consequences will result from the increased direct employment, secondary employment, purchases of materials and supplies, and provision of taxes.

1.2.10 Timber Harvesting

The project is presently scheduled to use 231,000 cords of balsam fir, spruce, and birch per year. This wood will come from areas within the region, both in Minnesota and Wisconsin. The project is expected to have minimal impacts on timber resources. Adequate supplies of surplus timber currently exist in the region. Timber operations associated with the project have the potential to create approximately 250 additional jobs. This is an important benefit in a region of high unemployment. Environmental impacts from timber harvesting to streams and soils are generally short term and decrease over time. New open habitat created by clearcutting is expected to benefit a wide variety of species. Forest aesthetics will also be affected by clearcutting. The state governments of Minnesota and Wisconsin have formulated guidelines to reduce impacts associated with timber harvesting. These guidelines along with any other necessary mitigation measures, will be used to reduce potential adverse impacts.

1.3 ALTERNATIVE ACTIONS

One requirement of the EQB rules is that alternatives to the proposed action be evaluated in the EIS, including the alternative of no action or no project. The draft EIS contains a description and evaluation of two alternative actions to the proposed action. Alternative actions were suggested through the development of the EIS scope and were evaluated by MCPA staff.

- o The Fully Permitted Action Alternative: Under this alternative, the papermill would operate at proposed action levels. However, the Hibbard Station would operate at full capacity, generating additional electricity for the Minnesota Power System.
- o The No Action Alternative: The proposed Lake Superior Paper Company Mill would not be constructed and no modifications would be made to the Hibbard Station.

CHAPTER 2

INTRODUCTION

2.0 INTRODUCTION

This chapter provides a description of the Minnesota environmental impact statement EIS process including its regulatory requirements and application to the proposed project. A listing of permits which will be required for the project is also provided. Lastly, the content and organization of this EIS are described.

2.1 ENVIRONMENTAL IMPACT STATEMENT PROCESS AND CONTENT

The Minnesota Pollution Control Agency (MPCA) is the responsible governmental unit for this EIS, which is being prepared as a mandatory EIS pursuant to Minnesota Rules Part 4410.4400 subpart 10 of the Environmental Quality Board (EQB). In accordance with EQB rules, the MPCA prepared a scoping environmental assessment worksheet (EAW) for the project. The scoping EAW provided a preliminary description of the project and identified the major issue areas associated with the project. The EAW was officially listed on July 29, 1985 and a public scoping meeting was held in Duluth on August 22, 1985. The comment period regarding the scope was open through August 28, 1985. Concerns which were identified in the EAW and voiced at the public scoping meeting and in written comments for the project were reflective of the typical range of potential environmental problems. The most significant concerns were the topics of air quality and housing relocation.

The MPCA adopted a Scoping Decision on September 24, 1985 based on consideration of the EAW and all comments received on the project during the EIS scoping period. The Scoping Decision for the EIS identified the issues and alternatives to be addressed, potential impact areas resulting from the project, necessary special studies needed, and permits for which the staff expects information to be gathered concurrently with EIS preparation as required by EQB rules.

Preparation of the draft EIS utilized information from Minnesota Power and Pentair, Incorporated and its consultant, ERT, Incorporated, and additional information collected by the MPCA and its consultant, NUS Corporation. Using the best available information, technical reports were prepared by the consultants. ERT prepared reports covering air quality, odor, water quality, noise, land use and zoning, transportation, geology/solid waste, and ecology. NUS prepared reports on economic and social conditions and timber harvesting. These technical reports provide the informational and technical basis for this draft EIS.

2.2 PERMIT REQUIREMENTS

One major purpose of the EIS process is the generation of information that can be used by governmental agencies in making decisions on permit applications. During the permitting process, the various agencies review the impacts and effects of the project on the environment to determine whether it will meet applicable environmental and safety standards. If the agencies determine that the proposed project will comply with applicable standards, permits authorizing construction are issued. If one or more permitting agencies determine that applicable standards will not be met, permits must

be denied and the project must be modified or the proposal abandoned. The permits that the Lake Superior Paper Company must obtain for the construction and operation are listed in Table 2.2-1.

2.3 EIS ORGANIZATION

Three major chapters follow this introduction which together constitute the major elements of this EIS. Chapter 3 is a description of the proposed project including detailed information on site preparation, papermill processes, facilities; and modifications to utility systems and the Hibbard Station. Also included is a description of the fully permitted action and no action alternatives. Chapter 4 contains baseline environmental and socioeconomic information for the project site and other related areas. Chapter 5 contains impacts of the proposed project along with the fully permitted and no action alternatives. Possible mitigation measures are also included. Chapters 4 and 5 are both organized into 10 parallel sections, each of which corresponds to a major environmental topic (e.g., air quality) and companion technical report prepared for this project.

Table 2.2-1. Lake Superior Paper Company Required Permits

Permit Name	Structure/Activity	Agency
PAPERMILL		
Air Emission Facility Permit	Clay/starch handling Storage piles Fugitive emissions Debarking facilities Wood handling and transport Associated pollution control equipment	MPCA
Pretreatment Permit	Plant discharges to POTW	WLSSD
Liquid Storage Permits	Acid tanks Caustic tanks Bleach tanks Oil storage	MPCA State Fire Marshall
Conformance to Spill Prevention Counter-measures and Control Plans	Oil storage	EPA
Conformance to Code of Elevator Plans	Elevators	MDL&I
Conformance to OSHA Codes	Hoists, cranes, ladders, walkways, stairways, etc.	MDL&I
Approval of Potable Water System	Plumbing of potable water	MDH St. Louis County
Open burning	Demolition activities	MPCA
Conformance with Asbestos Removal Requirements	Demolition activities	MPCA
HIBBARD STATION		
PSD Permit	Facility air emissions	MPCA EPA
Air Emission Facility Permit	Boilers (1 through 4) Wood/coal/ash handling Fugitive emissions Associated pollution control equipment	MPCA

Table 2.2-1. Lake Superior Paper Company Required Permits (Continued)

Permit Name	Structure/Activity	Agency
NPDES Permit Modifications	Plant discharges	MPCA
Pretreatment Permit	Sanitary wastes Demineralizer waste Misc. plant wastes discharged to POTW	WLSSD
Surface Water Appropriation and Consumption	Station and mill water using systems	MDNR
Work in Public Waters	Intake and discharges structure activities below high water mark barges, piers, etc.	MDNR
Activity in Water Way	Any activities in waters/intake and discharge	U.S. Army Corps of Engineers
Section 404	Dredge and fill activities	U.S. Army Corps of Engineers
Section 401	Water quality certification for activities in waters	MPCA
Liquid Storage	Oil, acid, caustic storage facilities	MPCA State Fire Marshall
Conformance with Asbestos Removal Requirement	Demolition activities	MPCA
Open Burning Permits	Demolition activities	MPCA
Obstruction to Navigation	Barges, docks, activities in waters, overhead steamline	U.S. Coast Guard
National Board Boiler	Boiler	MDL&I
Conformance to Spill Countermeasure and Control Plan Requirements	Oil storage	EPA

Table 2.2-1. Lake Superior Paper Company Required Permits (Continued)

Permit Name	Structure/Activity	Agency
Approval of Potable Water System	Plumbing of Potable Water	MDH St. Louis County
Conformance of Elevator Plans	Elevator	MDL&I
Conformance to OSHA Codes	Hoists, ladders, walkways, cranes, etc.	MDL&I

CHAPTER 3

DESCRIPTION OF THE PROJECT

3.0 DESCRIPTION OF THE PROJECT

The project and its alternatives constitute the actions upon which potential environmental impacts are projected. A description of the overall project, its construction, its facilities and its processes is presented in this section. Information used in this section was gathered from ERT, 1985 and Lindholm, 1985.

3.1 PROJECT OVERVIEW

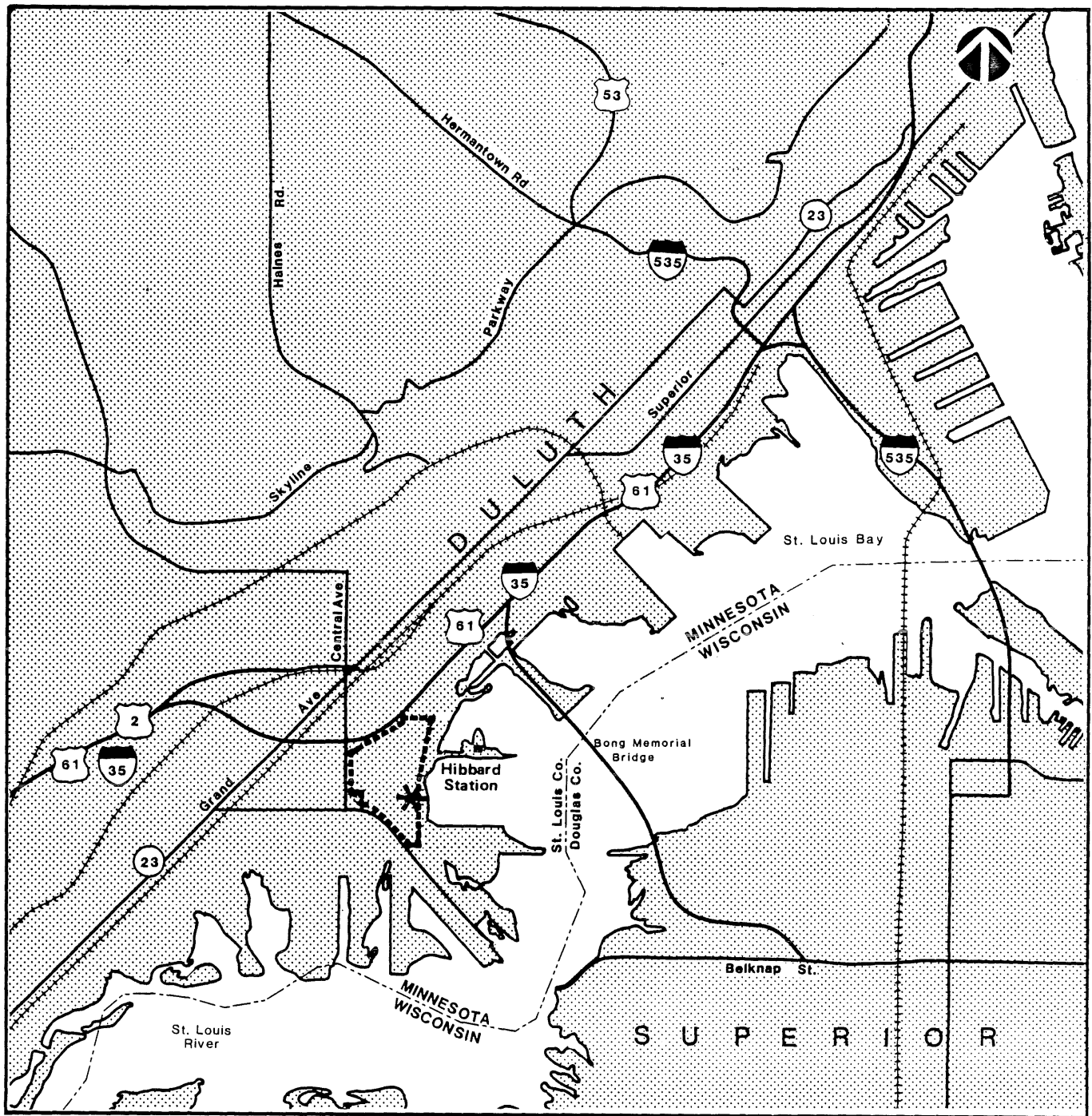
Lake Superior Paper Company, a joint partnership of Minnesota Power Company and Pentair, Inc., proposes to build a papermill in the west end of the City of Duluth, Minnesota (Figure 3.1-1). The mill would produce 234,900 tons per year of lightweight supercalendered paper. The daily shipped weight would be 653 tons. Paper from the mill would be sold for use in magazines, preprints, catalogs, and for the printing of advertising circulars. The installation of one paper machine is proposed at this time. However, it is anticipated that a second paper machine will be installed some time in the future.

The project would be located on a tract of approximately 92 acres, which is presently occupied by a number of single family dwellings, several commercial/industrial buildings, an iron and steel scrapyard, and small tree growth and wetland vegetation (Figure 3.1-2). The land is not presently owned by the City of Duluth or the project owners, but is owned by other private concerns. The total 92 acres is under the industrial development plan for the City of Duluth and must be acquired by the City.

In order to encourage development of the project by Lake Superior Paper Company, the City of Duluth is offering the companies \$53.1 million in tax increment financing, tax credits and exemptions, and employment and training subsidies. Included in that sum is the exemption from \$9 million in state taxes and \$1.5 million in city taxes. Of the remaining \$42.6 million of economic incentives, the largest would involve \$26.2 million in tax increment financing. For more detail see Section 5.9.

In support of the papermill, the project would entail development of the following facilities:

- o Woodyard for receiving and storing pulpwood
- o Wood preparation facilities including a debarker, slashing machine, and pulpwood conveyor
- o Pressure groundwood pulping facilities including pressure grinders with associated shredders, pulp clearers, and screens
- o Pulp makedown area for processing kraft pulp
- o A bleach plant including thickeners, bleach tower, bleach washer, and storage tank



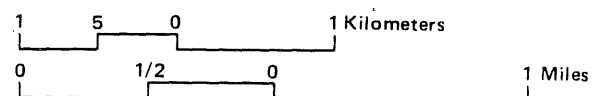
Legend



Site Boundary



Proposed Papermill

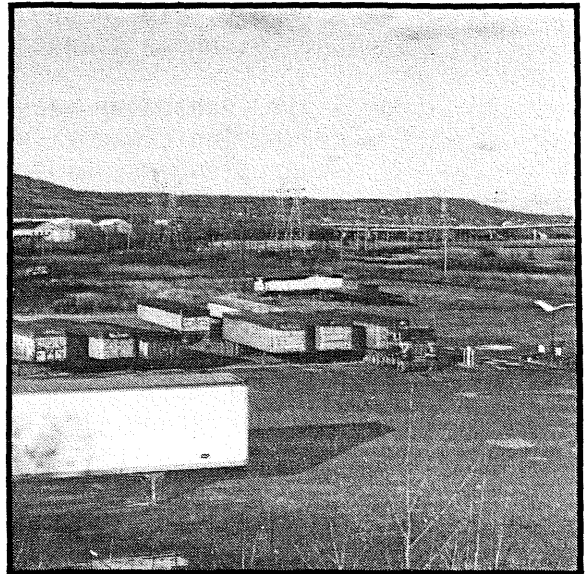


Project Site Location

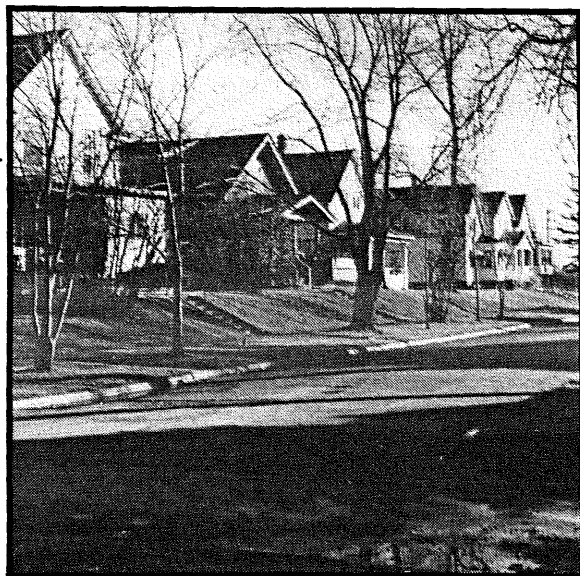
Figure 3.1-1



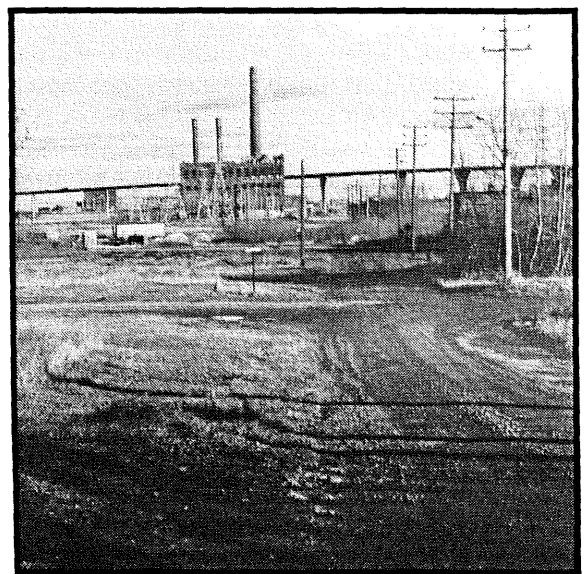
Scrapyard



Project Site — North View



Typical Residential Street



Hibbard Station

Plant Vicinity Views

Figure 3.1-2

- o Stock preparation equipment including refiners, low density chests for pulp, bleach chest, machine chest, broke chest, water storage chests, broke cleaner and deflaker
- o A 319-inch paper machine with auxiliary equipment including deaeration-cleaner system, screens, machine pulpers, roll splitter, supercalenders, winders, roll grinder, and roll lathe
- o Retrofitting of Units 3 and 4 of the Hibbard Station to burn coal and bark to produce steam for the mill, including condensate water treatment system.
- o Utility systems including package raw water treatment system, wastewater primary clarifier, electrical substations, steamline and condensate return line
- o Support facilities including office, maintenance shop, warehouse, railyard, and truck trailer yard.

Figure 3.1-3 is a preliminary plant site layout. As shown in this figure, the area is bounded by I-35 on the north, Central Avenue on the west, railroad right-of-way and the St. Louis Bay waterfront on the east, and Old Highway 2 and the property of The Moline Company on the south. Much of this area would be landscaped and would serve as a buffer between the mill and the residential areas west of Central Avenue.

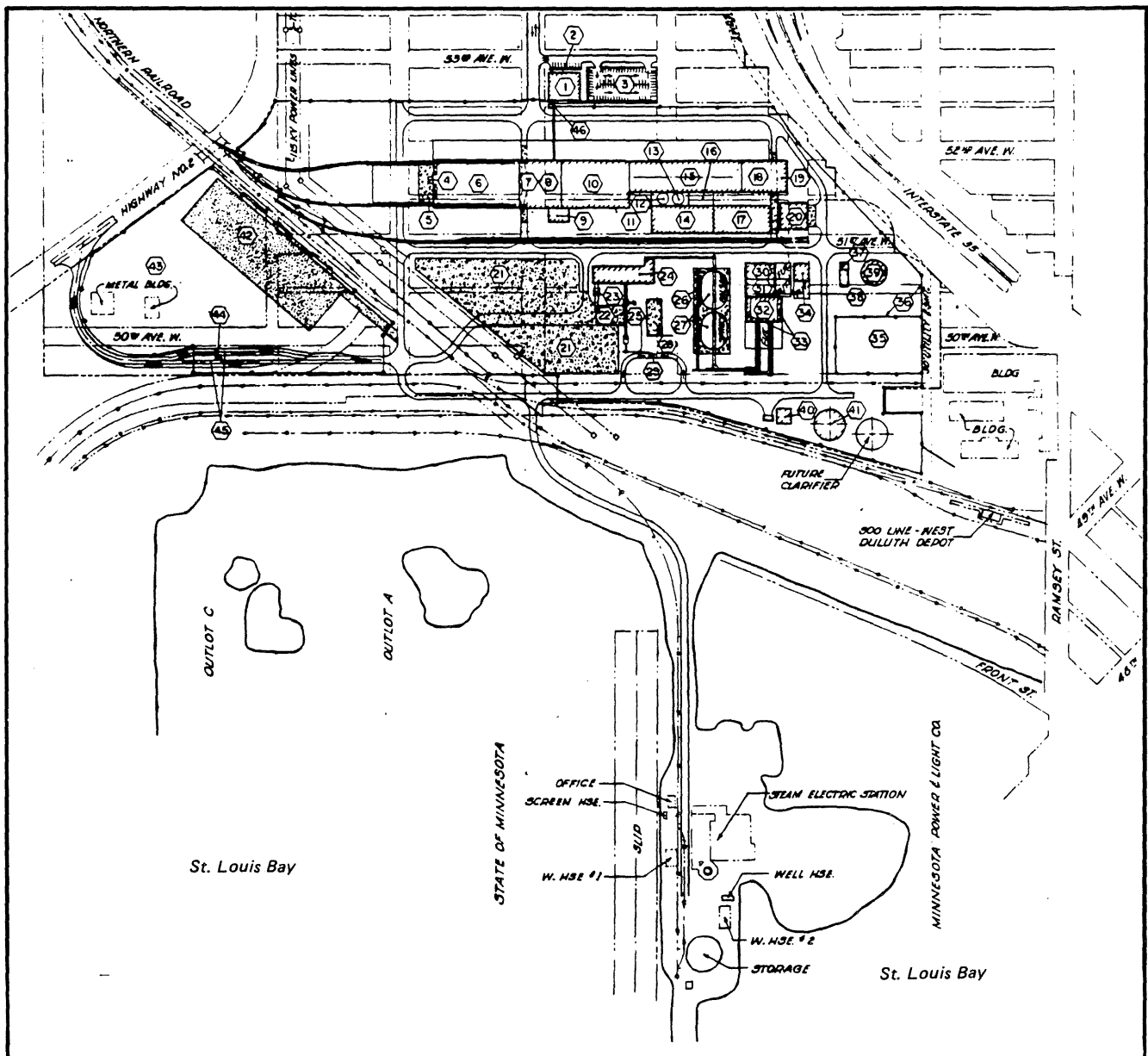
Table 3.1-1 lists the quantities of all chemicals and additives that will be used. Figure 3.1-4 is a process flow diagram. Machine furnish would be comprised of groundwood pulp, bleached kraft pulp, and filler. The groundwood component would use approximately 171,000 cords of spruce and balsam per year.

The estimated cost of the project is 274 million dollars. The facility would employ approximately 300 permanent employees and support approximately another 250 in wood cutting and related industries in northeastern Minnesota and northwestern Wisconsin. Construction would take approximately two years; the peak construction force is estimated to be 1460.

3.2 SITE PREPARATION

Major site preparation activities include acquisition, demolition and cleanup of the site and site-wide modifications to water, sewerage, electrical and transportation systems. Development of the project will require acquisition of 281 parcels of land. Table 3.2-1 lists the existing uses of these parcels.

The City of Duluth will undertake acquisition and relocation of homes and businesses in compliance with the Federal Real Estate Acquisition and Relocation Assistance Act of 1970. Terms of this law must be met when there is any public taking of property. Demolition of the structures, at least to ground level and site grading will follow expeditiously to allow for construction activities.



LEGEND

- PROPERTY LINE
- EXISTING FACILITIES
- PROPOSED FACILITIES
- ===== BITUMINOUS PAVEMENT
- ===== CONCRETE PAVEMENT
- ===== BASED SURFACE
- ===== EXISTING TRACK
- ===== PROPOSED TRACK
- ===== SECURITY FENCE

PROPOSED FACILITIES

- 1 ADMINISTRATION BUILDING
- 2 VISITORS PARKING
- 3 PARKING
- 4 OFFICE
- 5 RAMP
- 6 ROLL STORAGE WAREHOUSE & SHIPPING
- 7 DOCKS
- 8 ROLL WRAPPING
- 9 EMPLOYEE SERVICE BUILDING
- 10 SUPER CALENDERS & WINDERS
- 11 CLAY TANK AREA
- 12 B.K. TANK
- 13 W.W. TANK

- 14 ADDITIVES
- 15 PAPER MACHINE
- 16 VACUUM PUMPS
- 17 PULP MAKE-DOWN
- 18 STOCK PREP.
- 19 ROLL GRINDER
- 20 SHOPS & STORES
- 21 LOG STORAGE
- 22 LOG RECEIVING
- 23 THAWING CHAMBER
- 24 WOOD ROOM
- 25 BARK RECLAIM
- 26 LOG RECLAIM
- 27 DEBARKED LOG STORAGE
- 28 BARK STORAGE
- 29 BARK TRUCK LOADING
- 30 BLEACH PLANT
- 31 SCREEN ROOM
- 32 PGW MILL
- 33 MOTOR CONTROL
- 34 TURBINE GENERATOR
- 35 SUB-STATION
- 36 SECURITY FENCE
- 37 CLEARWELL
- 38 WATER TREATMENT BUILDING

- 39 WATER STORAGE TANK
- 40 SLUDGE BUILDING
- 41 CLARIFIER
- 42 SPRING SLUDGE WOOD STORAGE
- 43 EQUIPMENT STORAGE & CONSTRUCTION LAYDOWN
- 44 SCALE HOUSE
- 45 SCALES
- 46 GUARD HOUSE

Plant Site Layout

Figure 3.1-3

Table 3.1-1. List of Chemicals and Additives Used Based on
653 Tons/Day of Paper

Chemicals/Additives	Quantities
Alum	9,100 #/day
Filler clay	296,000 #/day
Spruce	622,000 #/day
Balsam	1,325,000 #/day
Long fiber kraft	258,000 #/day
Cationic starch	8,700 #/day
Hydrogen peroxide (50%)	2,900 #/day
Sodium silicate	3,400 #/day
Sodium hydroxide (50%)	4,050 #/day
Sulfur dioxide	500 #/day
Sodium boro hydride	434 #/day
Sequestering agent - DPTA (as received)	1,700 #/day
Diethylene-thiamine-penta-acetic acid	
Chlorine	70 #/day
Slimicide-nalco 7620WB	230 #/day
Caustic cleaner for paper machine	11 #/day
Sulfuric acid	290 #/day
Retention aid	3,190 #/day
Talc	580 #/day
Primary clarification polymer	29 #/day
Road salt (winter only)	460 #/day
Wax lamina for packing	2,300 #/day
Jute wrap	1,150 #/day
Cardboard headers	1,150 #/day
Fiber core material	900,000 Linear Feet
Glue-hot melt	87 #/day
Adhesive	29 #/day
Core plugs and caps	1,500 /day

Table 3.2-1. Project Site Existing Land Uses

Existing Uses	Number of Parcels
Single family dwellings	59
Duplexes	15
Apartment unit (21 units)	1
Commercial/industrial facilities	7
Other improvements	7
Vacant	192
Total	281

All demolition waste from the homes and businesses will be disposed of by the City of Duluth. The disposal of normal solid waste will be at a permitted solid waste landfill or at alternative sites that will accept such fill. Asbestos insulation will be removed and disposed of from areas that will be modified. A qualified contractor, familiar with all applicable local, state and federal regulations will be retained.

Two areas containing hazardous wastes are located on the site. The first is the Union Compressed Steel scrapyard site which contains lead-contaminated soil. The second is an area of groundwater contamination by volatile organic compounds (VOC's) near the east edge of the site. Both will be cleaned up in accordance with MPCA requirements prior to the commencement of construction in those areas.

3.3 PAPERMILL FACILITIES

The papermill will include facilities for the receiving and preparation of pulpwood, pulp production, pulp bleaching, and a single paper machine with off-line supercalenders. Additional facilities will be provided for finishing wrapping and shipping of the product. These major components and their support facilities are described in the following sections.

3.3.1 Wood Preparation Area

Approximately 171,000 cords of wood a year would be required for pulp production. The average daily requirement of 475 cords would be delivered by truck. Pulpwood, comprised of spruce and balsam, would be delivered in 8-foot lengths, in one, sometimes two shifts per day, five days per week. Most wood would be delivered during the day shift. Access to the woodyard would be from the Central Avenue exit of I-35 and then via Old Highway 2. The woodyard would be located in the southeast corner of the property where incoming trucks will be received and unloaded. Spruce and balsam would be received, processed and stored separately. Movable transporting equipment would be used to offload and load the piles into a processing conveyor for the bark removal process. Pulpwood would be thawed (if frozen), slashed to 4-foot lengths in a two saw slasher, debarked in a barking drum, delivered to outside storage areas, then reclaimed and sent to the grinder building. Pulpwood unsuitable for groundwood would be removed from the system after debarking. Fines from the slasher and bark from the barking drum will be

collected and sent to a disc screen to remove oversize material which will be hogged. There will be a belt conveyor supplying debarked wood to each of two grinder charging systems. The 98 tons per day of bark and fines produced from the debarking and slashing operations will be pneumatically conveyed to storage, then transported by truck to the power plant for incineration in the boiler.

The woodroom will operate 21 shifts per week. Since wood will be received only 7.5 shifts per week, 60-80 percent of the wood will require storage for later processing. The wood receiving area will be 192,000 square feet and would provide for efficient storage and reclamation of 10,300 cords of the two species. An additional 30,000 square foot area will store debarked logs.

Wood stored in this primary area will be on a concrete base. A remote storage area will also be provided. Wood here will be stored on the ground. The remote storage area will increase the total storage capacity to 20,000 cords, which may be required during spring breakup when road restrictions prevent wood delivery. The woodyard will have provisions for runoff collection to be discharged through the storm sewer system after grit removal.

3.3.2 Pressure Groundwood Pulping Process Area

The pressure groundwood (PGW) pulping process begins with the feed of debarked, slashed pulpwood to the grinders and ends at the unbleached pulp discharge pump. Major equipment in this area includes pressure grinders with associated shredders and blow cyclones, a pulp screening and cleaning system, screen rejects refining, and a heat recovery system to produce clean steam for drying paper. Debarked pulpwood logs will be delivered by conveyor to the grinders.

Pressure grinders would reduce raw pulp, discharging it through shredders to cyclone separators for removal of generated dirty steam. This assembly will be located in a building 140 feet wide by 90 feet long, by 60 feet high, adjoining the screening and bleaching building. Raw pulp will be screened to remove rejects and then dewatered. Screen rejects will be refined for fiber recovery and cleaned with centrifugal cleaners. The dirty steam separated from the raw pulp will be sent to a reboiler for producing clean steam.

The proposed pulpmill will have a capacity to produce 450 tons per day of mechanical pulp. Storage would be provided using an external storage tower for 200 tons of pulp.

3.3.3 Bleaching System

The pulp will initially be bleached in a single stage bleaching system. Pulp from the 200-ton unbleached storage chest will be pumped to the bleach plant. The bleaching will be done by sodium hydrosulfite using a sodium boro-hydride system. After the first two years, if the market demands higher brightness paper, a second stage hydrogen peroxide system will be added for bleaching a proportionate share of groundwood pulp for higher brightness.

3.3.4 Additives Facilities

Bales of bleached kraft pulp will be received by rail or truck and processed in the pulp makedown area and later conveyed to the stock preparation area. Clay will be received in tank cars in dry form. Upon receipt, the clay will be made into slurry stored in storage chests. The clay is used as filler and will be pumped to the paper machine as required for use.

Defoamer, slimicide and felt cleaning chemicals will be received in drums. The defoamer and slimicide will be metered directly from the drums as required.

Retention aid will be received in bags and will be made down with water in the retention aid mix tank. It will then be pumped to the retention aid supply tank, and from there it will be pumped through a filter to the paper machine as required.

Starch will be received and stored in the starch supply tank. From there, it will be pumped as required to the paper machine. Dyes will be stored in the dye mix tank. From the mix tank, dyes will then be pumped to one of four dye head tanks.

A building will be required to house the additive equipment which will include unloading facilities, storage vessels, starch and clay slurry preparation equipment, retention aid makedown equipment, and the necessary pumps and controls to supply additives to the stock preparation and paper machine. This building would be 100' by 220' and 40' high, and would have facilities for unloading four railroad cars.

3.3.5 Stock Preparation Area

Major stock preparation equipment includes refiners, storage chests for the pressure groundwood and softwood pulps, blend chest, machine chest, broke chest, saveall, a clear white water storage chest, clear and cloudy white water chest, broke cleaner and deflaker, and filtered white water chest. The stock preparation area will be housed in the paper machine building.

3.3.6 Paper Machine

The paper machine will be designed for a net production of approximately 653 tons per day, with 360 operating days per year. The paper machine would consist of a headbox, wet forming section, pressing section, and steam heated after drying section. Supercalenders are followed by winders and a salvage winder.

Paper stock will mix with the silo white water and be pumped into a cleaner system. The rejects from the fourth stage of the cleaner system will discharge to the sanitary sewer.

Clean stock will be pumped through a primary pressure screen to the headbox. The forming section will utilize a fourdrinier. The press section will be a combination press.

From the press section, the sheet tail will be manually transferred into the carrier rope and fed into the dryer section. The dryers will be arranged in five sections. Each dryer will be equipped with rotary pressure joints and rotary siphons and a cascade condensate system. The dryer section will be equipped with an insulated, enclosed hood and basement enclosure. The hood employs energy efficient air systems, including fans, drives, steam air heating coils, heat recovery system, filters and ductwork.

The reel will be of the horizontal-transfer type with pneumatic loading. It will be designed to wind parent rolls to 96-inch diameter on 27-inch diameter reel spools.

Positive pressure will be maintained within the machine room area by building makeup air units and exhaust fans. Roof heating systems will be provided to prevent condensation from forming on the underside of the roof as will air conditioning in the control rooms.

The building required for housing the stock preparation equipment, the paper machine equipment, supercalenders, and winders will be 800 feet long by 110 feet wide by approximately 75 feet high with a 58 foot by 240 foot by 40 foot high extension in the winder area. The basic structure will be structural steel framed with two main concrete slab floors, an operating floor and basement, with mezzanine over the drive side of the machine. The supercalender and winder area will have basement floors only.

3.3.7 Roll Handling, Wrapping, and Shipping Facilities

Finished rolls of paper from the winders will be conveyed to the roll wrapping area. The rolls will be weighed, wrapped, crimped, glued, headed and labeled. The rolls will then be conveyed into the warehouse to either of two upenders and accumulating conveyors, where trucks will transport them to storage or where they will be loaded directly in railroad cars or trucks. Approximately 70 percent of the finished paper will be shipped by rail, with the remainder shipped by truck.

The finishing and shipping equipment will be housed in the warehouse, a precast concrete frame building 450 feet long by 168 feet wide, with 20 feet of clear height. Two rail lines will enter the building at the south end, one on each side of the warehouse, providing five rail loading spots each. Six truck loading docks will also be provided at the south end of the building.

3.3.8 Instrumentation and Controls

The instrumentation and control systems will be selected on an individual basis, with each component selected for its suitability for the specific system. The paper machine, stock preparation, additives and bleaching areas will be controlled from a central control room located at the west end of the paper machine using a microprocessor-based, solid state distributed control system. The wood grinding area will be equipped with a control room and a distributed control system similar to the central control room. Control and surveillance will be provided for wood grinding, screens, cleaners, refiners, pulp makedown, and steam recovery. Similarly, the woodyard and utilities will also be equipped with separate control consoles.

3.3.9 Transportation Facilities

Major site improvements are required to permit wood and coal delivery by truck. New roadwork will include asphalt paving to handle the anticipated heavy truck traffic. Additional site roads will be upgraded to accommodate the increased traffic.

Two vehicle entrances in addition to a railroad entrance will be provided. One entrance would direct employees to the parking lot and would be used by all truck traffic except wood hauling trucks and power plant traffic. The second entrance would be provided from Old Highway 2 for these hauling trucks and power plant traffic. Adequate parking for visitors and employees will be provided.

The Burlington Northern Railroad right-of-way and track traverse the southern portion of the site in a northeasterly/southwesterly direction. Three spurs would be extended north to the mill.

3.4 UTILITIES

Project utility systems include water supply, wastewater management and energy. Solid waste products are primarily associated with the Hibbard Station and are discussed in Section 3.5.

3.4.1 Water Supply

The principal structure associated with the water supply is a 1.5 million-gallon water storage tank to be used for storage and fire reserve. Water will be pumped to the storage tank from the St. Louis Bay intake structure at the Hibbard Station. Process water will flow by gravity from the storage tank to a package water treatment system consisting of a high rate adsorption clarifier, mixed media filtration, and chemical feed systems.

The principal chemicals used for the processing or clarification of raw water treatment will be alum or aluminum sulfate (1000 pounds per day) and a high molecular weight polymer (3 pounds per ton of sludge). It is anticipated that 900 pounds per day of sludge will be precipitated in the raw water clarification tank, but that this will vary depending upon the quality of river water received. During rain water runoff in the spring to fall season, levels of 10 to 20 pounds of polymer per day will be needed to precipitate a maximum of 2000 to 4000 pounds of solids from the raw water. The raw water treatment system will reduce the color in the water and protect against large quantities of suspended solids from entering the processes. A large clear-well with three vertical turbine pumps will be used to supply backwash water to the filters and process water to the mill. The average daily withdrawal of water from the river will be between 3.5 and 4.0 mgd.

Process water will be delivered to the papermill in an 18-inch carbon steel pipeline. The pipeline has the capability of delivering the process water required for two paper machines, although the pumping capacity will initially be limited to one pump to satisfy the demand of only one paper machine. Provisions will be made to facilitate the future installation of a second pump. The pump(s) will take suction from the existing cooling water

intake tunnel from the screenhouse to the station. The pump(s) will be located in the new prefabricated building located near the existing screenhouse.

A chlorination system must be added in the screenhouse to provide shock treatment of the process and cooling water. The intake screens will be reused as only minor repairs appear necessary.

The intake structure is composed of trash racks and a series of travelling screens. The total surface intake area at the four forebays is 81 square feet (sq. ft.), and the effective surface intake area is approximately 63 sq. ft. Trash racks are used to prevent large objects from entering the intake structure. Screens are used to keep out smaller organisms and sand that pass through the trash racks.

The City of Duluth's system has adequate capacity in the local mains to provide up to 400 gpm to the plant for nonprocess and plant potable water needs. The projected demand is approximately 210 gpm. Existing water lines on the site will provide water to the papermill. In addition, a new 10 inch main will be installed from Central Avenue to the mill and along the eastern border of the site. A few small distribution lines will be abandoned.

3.4.2 Wastewater Treatment and Disposal

The wastewater from the various process areas will be combined in a single sewer and pretreated before being directed to the Western Lake Superior Sanitary District (WLSSD) treatment plant for final treatment. The WLSSD treatment plant is located approximately 2.5 miles to the north of the site. The District will provide for the collection of increased sewage flows by modifying and relocating existing sewers and by constructing new sewers and pumping facilities. Domestic sanitary flow from west of the site will be intercepted and pumped to a relocated 48 inch pressure sewer along the north property line. Pretreated mill effluent will be discharged through a new pumping facility to an existing sewer on the east side of the site. Nonprocess wastewater and sanitary waste from the facility will also be discharged to this sewer. The wastewater would be delivered to the treatment plant at the average rate of 3 mgd. The peak discharge is expected to be 4.9 million gallons per day.

The pretreatment system for process wastewater consists of a mechanically cleaned bar screen to remove trash and other debris and a primary clarifier to remove suspended solids. Sludge will be pumped from the clarifier at 2 percent solids and dewatered to approximately 35 percent solids. Sludge will eventually be incinerated at the Hibbard Station, whereas filtrate will be directed to the sewer. Pretreatment will remove approximately 30 percent of the five-day biochemical oxygen demand (BOD5) and 80 percent of the total suspended solids (TSS).

The characteristics of the raw wastewater (including five-day biochemical oxygen demand (BOD5) and total suspended solids (TSS)) input to the pretreatment plant are shown in Table 3.4-1. Peak conventional pollutants are expected to be 50,000 pounds per day of BOD and 40,000 pounds per day of solids. Peak BOD5 and TSS loads represent extreme upset conditions within the mill in which broke or waste paper may be discharged to the primary

Table 3.4-1. Characteristics of Raw Wastewater

Parameter	Value	
Flow	Average:	3.0 mgd
	^a Peak:	4.9 mgd
BOD5	Average:	11,000 - 23,000 lb/day
	^b Peak:	50,000 lb/day
TSS	Average:	14,000 lb/day
	^b Peak:	40,000 lb/day
Temperature	90 - 110°F	
pH	5.5 - 7.0	

a. Peak flow represents an instantaneous discharge rate.

b. Peak BOD5/TSS loadings represent extreme upset conditions within the mill.

Table 3.4-2. Characteristics of Pretreated Wastewater

Parameter	Value	
Flow	Average:	3.0 mgd
	^a Peak:	4.9 mgd
BOD5	Average:	7,700 - 16,100 lbs/day
	^b Peak:	35,000 lb/day
TSS	Average:	2,800 lb/day
	^b Peak:	8,000 lb/day
Temperature	90 - 110°F	
pH	5.5 - 7.0	
Toxic constituents	None	

a. Peak flow represents an instantaneous discharge rate.

b. Peak BOD5/TSS loadings represent extreme upset conditions within the mill.

treatment clarifier. However, the primary clarifier will settle out the majority of peak loadings of total suspended solids. There are no toxic discharges from the mill. The expected characteristics of effluent from the pretreatment system are shown in Table 3.4-2.

Development of the site will include construction of a new drainage and storm sewer system. The system will be designed in accordance with all local requirements and standard drainage practices.

3.4.3 Energy

The total electric power demand of the facility will be 55 megawatts. A new generator within the mill will furnish 5.5 MW in summer months and 13.4 MW in winter months. The groundwood mill will be the heaviest power consumer with an estimated demand at approximately 32.7 MW which will be supplied by the Minnesota Power Company (MP) system. A new substation, which will serve the mill as well as other MP customers, will be added as shown in Figure 3.1-2.

Steam requirements of the mill would be approximately 264,000 pounds per hour in winter and 142,000 pounds per hour in summer, to be supplied by the Hibbard Station. Steam uses in the papermill will include: thawing frozen logs (in winter), pulp making processes, drying paper, generating electricity, and mill heating needs.

3.5 HIBBARD STATION

As part of the project, major modifications of the Hibbard Station will be made to incinerate wood waste and wastewater sludge along with coal and wood chips to provide steam for the papermill. A history of this facility and a description of the proposed modifications are provided in this section.

3.5.1 History of the Hibbard Station

The Hibbard Station consists of four generating units with a total rated electrical output of 125 MW. Originally designed to burn coal, Units 3 and 4 were converted in the early 1960's to burn natural gas. In 1981, all four units were converted to burn distillate fuel oil. The units were shut down in 1981, and have been idle since.

The project proposes to convert Units 3 and 4 to burn wood chips, waste bark, coal and dewatered sludge. The modifications to the Hibbard Station are designed to enable the production and delivery of steam to the papermill for process and nonprocess needs and to one or more other nearby customers.

3.5.2 Steam Requirements

The proposed action is defined as the level of Hibbard operation required to provide steam to one paper machine. The papermill will have a maximum steam requirement of 264,000 pounds per hour (lb/hr) for a single paper making machine. Approximately 25,000 lb/hr of steam will also be made available for a second customer. The Hibbard Station itself will require steam for feedwater heating and station heating. Feedwater heating will take place in the deaerating heater, where approximately 70 percent of the steam delivered

to the papermill will be returned as condensate at 120°F. The remaining feedwater requirement will be made up by 50°F demineralized water. Approximately 35,000 lb/hr of steam is required to deaerate and heat the condensate in the deaerating heater so that feedwater is delivered to the steam generators at approximately 228°F. The station heating steam requirement is approximately 25,000 lb/hr and can be taken from either of the two units. On this basis, one boiler must be kept in service during winter for plant heating needs. One boiler will be able to satisfy the winter steam demand for short periods if the second boiler is out of service.

Hibbard Station Units 3 and 4 would be operated at their full capacity if a second paper machine were constructed, requiring an additional 300,000 lbs/hr of steam or if MP's electric demand and system generation costs dictated the need for electricity generation from Units 3 and 4.

3.5.3 Feedwater and Condensate Requirements

To satisfy the feedwater requirements, a relatively large amount of condensate must be made to offset the condensate not being returned from the papermill and the other customer. Approximately 97,000 lb/hr of condensate total must be added to the system based on a one paper machine operation. In the event a second paper machine is ever installed at a papermill, a total of about 169,000 lb/hr of condensate will be required.

3.5.4 Fuel Requirements

Wood fuel will be available from various sources. The papermill will provide wood waste available at a rate of 98 tons per day (tpd) per machine. The remainder of the wood to be fired, under the proposed action, approximately 60,000 cords of wood per year, in the form of birch wood chips, will come from sources in northwestern Minnesota. Sludge (wood fibers and clay) from the mill's pretreatment system will be burned but will constitute less than 1 percent of the heat input to the boilers.

Low sulfur, subbituminous coal from either western or eastern United States suppliers, will be used. This fuel would be similar to that used at MP's Boswell Station and will be available from local docks. Supplemental natural gas at 1000 btu per cubic foot will also be available for use as an emergency fuel in burners remaining after boiler modification. The facility will also be capable of burning refused derived fuel (RDF). The feasibility of the use of RDF at the Hibbard Station will be examined in the future.

Due to anticipated SO₂ emission limitations, coal alone cannot be fired in the steam generator. Based on preliminary calculations, coal can contribute only 40 percent of the total heat input to the steam generators. These calculations were based on the use of coal with a heating value (hHV) of 8500 Btu's per pound and a 0.9 percent sulfur content and wood with a hHV of 4377 Btu's per pound and a 0.1 percent sulfur content.

3.5.5 Boiler Modifications

The principal modifications to the Units 3 and 4 steam generators will be the addition of a traveling-grate spreader stoker along with other necessary changes required to facilitate the burning of wood and coal.

The traveling-grate spreader stokers would include seven reciprocating feeders, overfire air system, and cinder return (ash reinjection) system. The combination feeders will permit firing of the necessary quantities of coal and wood. The cinder return system from the boiler hoppers will allow unburned carbon to be consumed within the furnace, thereby increasing the overall boiler efficiency.

Flue gas velocities within the steam generator gas passes should not normally exceed 50 feet per second when burning wood. Wood has a significant amount of sand which, when carried in the flue gas, can be very erosive. Therefore, the internal baffling must be modified to open up several gas passes to reduce the velocity to acceptable levels.

Existing gas burners will be removed only where necessary to facilitate location and installation of the new equipment. The reuse of the burners is dependent upon the location of the front waterwall header and chutework for the seven reciprocating feeders. The burners do provide for an emergency fuel source, and could provide supplemental heat input if the main fuel delivery to the station is interrupted.

3.5.6 Fuel Handling

The ultimate development of the fuel handling system will provide solid fuel heat input as required to vaporize a total of approximately 600,000 lb/hr of feedwater from both boilers. The normally expected operating mode will be such that coal would make up a maximum of 40 percent of the total required heat input with the balance (60 percent) made up from wood.

A truck unloader will be constructed for woodchip deliveries. The trucks will unload the wood into a live-bottom wood hopper, which will feed a pneumatic conveying system. Provisions will be made for the future installation of a disc screen and hogger after the wood hopper, if necessary, due to the size of wood chips received. The pneumatic conveying system will move wood either to the new in-plant wood metering bins or to new, outdoor storage silos. Each silo will have automatic reclaiming capability and a total storage of approximately 800 tons of woodchips. The two silos will provide approximately 50 hours of storage when firing 60 percent wood and satisfying the steam demand of one paper machine. The in-plant wood metering bins will provide approximately one hour of wood storage.

Coal deliveries will be by truck to the existing coal hopper. Depending on actual operation, 30 to 45 trucks can be expected in one shift. Provisions will be made for future rail delivery, although no trackwork is contemplated at this time. From the hopper, coal will be conveyed by a new feeder and chain conveyor to the existing crusher house roof. The coal will then be lifted by bucket elevator to the existing 20-inch wide tripper-conveyor located over the existing storage bunkers. The tripper conveyor and bunkers

will be reconditioned as a part of this work. The modified bunkers will allow approximately 112 hours of storage firing 40 percent coal and satisfying the steam demand of one paper machine.

3.5.7 Particulate Removal System

To meet emission limitations, new particulate removal equipment must be installed. An electrostatic precipitator is suited for the application since the flue gas generated from burning wood can contain burning embers that may carry over from the boiler to the particulate removal system. A mechanical collector will be located upstream of the final collection equipment to minimize the amount of unburned carbon that must be handled.

The concept of installing the electrostatic precipitators on the roof of the existing boilers was investigated as a possible cost-effective arrangement for the required equipment. Investigations determined that the concept is technically and economically feasible.

3.5.8 Ash Handling

A new dry pneumatic ash handling system has been included for the modification work at the Hibbard Station. One cost-effective feature of the system is the proposed use of the existing Unit 1 unused coal bunker for ash storage, in lieu of a new ash storage bin. The ash will be pneumatically conveyed from the siftings and front-end ash hoppers under the traveling gate and the new particulate removal system. The ash will be conveyed to receiving equipment located on the bunker room roof of Unit 1 and deposited in the bunker. The ash will be temporarily stored in this sealed dust-tight bunker. An air slide conveying system will transport the ash from the outlet of the bunker to a telescopic spout. The ash will be loaded in enclosed tank trucks and transported offsite for disposal.

Because of the explosive nature of wood ash, special consideration has been given to the design of the ash handling system. Explosion panels will be provided for the bunker and an inert gas system will be installed to reduce oxygen levels in the bunker. Based on the preliminary calculations, the bunker has sufficient capacity for three days of storage with both steam generators operating at maximum capability firing both coal and wood.

3.5.9 Condensate Water Treatment System

Approximately 97,000 pounds per hour of steam leaving Hibbard Station will not be returned as condensate. This is based on the steam demand of one paper machine. Therefore, the water makeup demand requires one 200-gallon-per-minute demineralizer. The demineralizer will consist of one cation vessel, one anion vessel, a regeneration system, acid and caustic tanks, and control panels and instrumentation. A new chemical feed system is required because of the relatively large amount of boiler makeup water. The system will include the necessary metering pumps and piping to the existing connections on the boiler and station piping. Provisions will be made for the installation of a second demineralizer if required by the future installation of a second paper machine. Duluth city water will be the primary

source of makeup water. The City of Duluth has sufficient capacity in the local mains to provide up to 400 gpm of water required by the makeup system and plant potable water needs.

The existing fuel oil storage tank will be cleaned, modified, refurbished, and lined to provide approximately 1,000,000 gallons of condensate storage for the makeup system. The storage tank will provide more than three days of storage at full load in the event that the demineralizer is out of service.

The water treatment equipment will be located in a prefabricated building on the east side of Units 3 and 4. The building will be easily expandable if required to house a second demineralizer in the future. A smaller prefabricated building will be located near the existing screenhouse to house the process water pump.

Demineralized water will be piped to the 1,000,000-gallon storage tank. From the storage tank, water will be piped to the existing condensate pumps. Condensate will be pumped to the deaerating heaters of the respective units using the existing condensate piping.

3.5.10 Feedwater/Steam System

After the modifications are complete, the steam produced will be sent off-site to the papermill and to another customer. A pipeline capable of delivering the steam demand of two paper machines will be provided. The steam will be distributed to the papermill using a 14-inch schedule 80 carbon steel pipeline. Piping modifications and isolation valves on the main steam header of the steam generators are required and included for the new piping distribution system. A connection on the steamline will be provided for the second customer.

The piping will be supported above ground and will incorporate loops to accommodate expansion. The interface point will be at an isolation valve at a building wall at the papermill utility building. Piping inside the station must be modified to provide steam to the deaerating heater for feedwater heating and also to the station heating system. The feedwater system utilizes the existing system piping and pumps where possible. Because an economizer will be added on the boilers, some feedwater system components must be relocated. A desuperheating spray valve station will be added to the system as the existing steam temperature control system will not be reused.

3.5.11 Heating, Ventilating, and Air Conditioning (HVAC)

A dust collection system shall be provided at the existing coal hopper unloading facility to control fugitive coal dust during unloading. The system will be designed to control dust at the hopper, feeder and transfer points.

A heat and vent system shall be provided for a small fuel handling system electric equipment room. The system is designed to pressurize, heat, and ventilate the room. A similar pressurized system will be required for the new boiler control area and electrical switchgear room located in the north-east corner of the Unit 4 boiler room.

A dust collection system shall be provided for the tripper room to control fugitive dust while filling the bunkers and to continuously ventilate the bunkers for methane gas. Pickup points for the system shall be located at the bunkers and the transfer point to the tripper conveyor. Coal dust collection and ventilation systems are designed for the Lowest Achievable Emission Rate (LAER).

A makeup air/heating system shall be provided for the tripper room to supply tempered makeup air to the room equal to the quantity continuously exhausted by the dust collection system. The system consists of several packaged steam, makeup air units.

As part of the overall project, some of the existing ventilation equipment may require demolition. Installation of several local ventilation fans may be required to limit boiler room temperatures.

3.5.12 Asbestos Removal and Disposal

Asbestos insulation will be removed and disposed of from areas that will be modified. A qualified contractor familiar with all applicable local, state, and federal regulations will be retained.

3.5.13 Miscellaneous

The causeway to the Hibbard Station will be rehabilitated with erosion control features added. The rehabilitation of the causeway will include the installation and/or modification of process water line, municipal water line, natural gas line, 14 kV electric distribution lines, 115 kV electric transmission lines and possibly the steamline (and return condensate line). A 24 foot wide asphalt road will be installed to provide access during construction and operation. An alternative steamline/condensate line route is being considered. The alternative route would exit the Hibbard Station, angle directly west over St. Louis Bay and terminate at the papermill turbine room. The alternative route will require the installation of fill or support structures in St. Louis Bay. As final engineering proceeds, a definitive route will be chosen and a description of environmental impacts and mitigative measures can be included in the FEIS.

Based on the coal being handled, a fire protection system must be provided. The coal unloading area and existing tripper room should be provided with a fire detection and suppression system to minimize the damage caused by fire.

A yard fire protection system will be provided in the vicinity of the coal and wood unloading areas, including the wood storage silos. The system will include fire hydrants and a fire department pumper connection. Both the coal handling area suppression system and the yard fire protection system will be supplied by the existing city water system.

3.6 IDENTIFICATION OF ALTERNATIVES

Reasonable alternatives to the proposed action are identified. These consist of the fully permitted action and the no action alternatives. The proposed action is included for comparison.

3.6.1 The Proposed Action

The proposed action is defined as the level of Hibbard operation required to provide steam to one paper machine, which corresponds to a feedwater flow rate of approximately 202,000 lb/hr (summer conditions) and 325,000 lb/hr (winter peak condition). These levels of steam output can be met by operating both Hibbard Units 3 and 4 at approximately 30 percent load (summer) and 50% load (winter).

3.6.2 Fully Permitted Alternative

The fully permitted action alternative for the project includes full operation of Hibbard Units 1-4 to produce steam necessary for the papermill operation at the proposed action levels and to produce additional electricity demanded by the MP system. The operating parameters at the Hibbard Station that change from the proposed action to the fully permitted action include: fuel consumption, water consumption, air emissions, thermal discharge, electricity generation, ash generation and truck traffic. A summary of the proposed action and fully permitted action alternative is presented in Table 3.6-1.

3.6.3 No Action Alternative

Under the no action alternative, no modifications would be made to the Hibbard Station and the papermill would not be constructed and operated. In the short term, the area would continue to be used as it is currently. None of the vacant parcels would likely be developed for residential use. The West Duluth area is already heavily commercialized and it is the city's long range plan to develop the site for industrial use. The Hibbard Station would continue to be idle, but with air and water appropriation permits that would allow it to operate should demand for power ever warrant.

TABLE 3.6-1. SUMMARY OF PROPOSED ACTION AND FULLY PERMITTED ACTION

Parameter	Proposed Action		Fully Permitted Action
	Annual Average	Maximum Daily ^a	
<u>Pulpwood consumption</u>	973	973	973
<u>Fuel consumption</u>			
- Wood	512 tons/day	898 tons/day	1796 tons/day
- Coal	171 tons/day	306 tons/day	612 tons/day
- Sludge	5.6 tons/day	5.6 tons/day	5.6 tons/day
- Oil	0	0	178,654 gal/day
<u>Truck traffic</u>	69/day	100/day	140/day
<u>Ash generation</u>	21 tons/day	48 tons/day	68 tons/day
<u>Air emissions</u>			
SO ₂	3.1 tons/day	5.5 tons/day	13.9 tons/day
NO _x	1.9 tons/day	3.4 tons/day	12.8 tons/day
TSP	.11 tons/day	.17 tons/day	.5 tons/day
<u>Electricity production</u>	0	0	93 megawatts
<u>Water consumption</u>	4 million gallons per day (St. Louis Bay)	4 million gallons per day (St. Louis Bay)	182 million gallons per day (St. Louis Bay)
	0.3 million gallons per day (municipal system)	0.3 million gallons per day (municipal system)	0.3 million gallons per day (municipal system)
<u>Thermal discharge</u>	0	0	178 million gallons per day
<u>Process wastewater discharge</u>	3 million gallons per day	3 million gallons per day	3 million gallons per day

a. Maximum Daily = Winter conditions; Units 3 and 4 operating at 50% capacity

3.0 References

Environmental Research & Technology, Inc., 1985. Duluth Paper Mill - Project Description, P-D864-801, prepared for PNTA-MPL, Concord, MA.

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CHAPTER 4

EXISTING REGULATORY AND ENVIRONMENTAL CONDITIONS

4.0 EXISTING REGULATORY AND ENVIRONMENTAL CONDITIONS

This chapter provides a baseline description of the existing environment with major emphasis placed on the areas of air, water, noise, transportation, land use/zoning, geology, solid/hazardous waste, ecology, economic/social conditions, and timber harvesting. Information utilized to prepare this chapter was based on technical reports for each subject area prepared by Environmental Research and Technology, Inc. and NUS Corporation. The information was augmented by more recent reports, personal communications, and limited field reconnaissance.

4.1 AIR QUALITY/ODOR

The potential for increased air emissions from the project requires a complete description of the existing air quality conditions in the vicinity of the project site and Hibbard Station and the applicability of air quality regulations to the permitting of these sources. Included in this section are discussions of the climatology of the Duluth area, emissions data for existing sources in the region, and existing ambient air quality levels in the area. A discussion of odor sources and receptors in the site area and applicable regulations is also presented.

4.1.1 Air Quality Regulatory Considerations

New stationary sources and modifications to existing sources must follow a new source permitting procedure in accordance with the requirements of the Clean Air Act. The Minnesota Pollution Control Agency (MPCA) and the U.S. Environmental Protection Agency (EPA) have promulgated air quality regulations that define ambient air quality standards, and impose design constraints on new or modified facilities, in order to achieve and maintain these ambient standards. The applicability of the following rules and regulations to the project and the Hibbard Station is addressed below.

- o National Ambient Air Quality Standards (NAAQS)¹
- o Prevention of Significant Deterioration (PSD) regulations
- o Nonattainment (NA) area regulations
- o MPCA air pollution control regulations
- o New Source Performance Standards (NSPS)

4.1.1.1 Ambient Air Quality Standards

The Clean Air Act of 1970 mandated that the EPA establish ambient ceilings for certain criteria pollutants based upon the latest scientific information regarding all identifiable effects a pollutant may have on public health or welfare. The EPA developed two classes of NAAQS: primary standards which

¹"National Primary and Secondary Ambient Air Quality Standards" (40 CFR Part 50)

define levels of air quality which the EPA has judged as necessary to protect public health, and secondary standards which define air quality levels for protecting the public welfare (e.g., soils, vegetation and wildlife).

Pursuant to the Clean Air Act and subsequent amendments of 1977, states were required to adopt plans to attain and maintain the NAAQS. The State of Minnesota has established ambient air quality standards for the criteria pollutants which are essentially the same as the NAAQS¹. Table 4.1-1 lists the state and national ambient standards for the six criteria pollutants. As can be seen from the table, in addition to the NAAQS, Minnesota also imposes a primary one-hour and secondary annual average SO₂ standard, a more stringent three-hour SO₂ standard for the project area, and a more restrictive one-hour-average CO standard. Besides the criteria pollutant standards, Minnesota has also established ambient standards for hydrogen sulfide and hydrocarbons.

Section 107 of the 1977 Clean Air Act Amendments requires EPA to publish a list of all geographic areas in compliance with the NAAQS as well as those not attaining the NAAQS. Areas not in compliance with the NAAQS are termed nonattainment. Areas meeting the NAAQS are referred to as attainment and are subject to the Prevention of Significant Deterioration (PSD) regulations, which limit the amount of possible deterioration in existing air quality. Areas which have insufficient data to make a determination are unclassified, but are treated as being attainment areas until proven otherwise. The geographic regions established for designating the air quality status with respect to compliance with the NAAQS are known as air quality control regions (AQCR). The project area is located in the Duluth-Superior Interstate AQCR (AQCR #129). This AQCR is designated as attaining the primary NAAQS for sulfur dioxide (SO₂) and unclassified or better than the NAAQS for nitrogen dioxide (NO₂) and ozone (O₃). The AQCR is designated as nonattaining the secondary NAAQS for total suspended particulates (TSP) in Sections 5, 13 and 17 of St. Louis County. The region is currently designated as nonattaining for carbon monoxide (CO). However, the state and EPA are currently in the process of redesignating the area as attainment. These areas are in the immediate vicinity of the project site.

4.1.1.2 PSD Requirements

The owner or operator proposing a major new source, or major modification to an existing source, located in an attainment or unclassified area, must obtain a PSD permit before construction may commence. The Hibbard Station is classified as a major source of SO₂, CO, and NO_x.

¹"Minnesota Ambient Air Quality Standards" (Chapter 7005).

Table 4.1-1. Summary of National Ambient Air Quality Standards (NAAQS) and Minnesota State Standards^a

Pollutant	Averaging Time	NAAQS ($\mu\text{g}/\text{m}^3$) ^b		Minnesota Standards ($\mu\text{g}/\text{m}^3$) ^b	
		Primary	Secondary	Primary	Secondary
Carbon monoxide	8 hours	10	10	10	10
	1 hour	40	40	35	35
Lead	calendar quarter	1.5	1.5	none	none
Nitrogen dioxide	Annual	100	100	100	100
Ozone ^c	1 hour	235	235	235	235
Particulate matter	annual ^d	75	60	75	60
	24 hours	260	150	260	150
Sulfur dioxide	annual	80	none	80	60
	24 hours	365	none	365	365
	3 hours	none	1300	1300	915 ^e
	1 hour	none	none	1300	none
Hydrocarbons ^f	3 hours	none	none	160	160
Hydrogen sulfide ^g	1/2 hour	none	none	70	none
				42	none

Source: Chapter 7005 and 40 CFR Part 50.

- National and Minnesota standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once a year (except where noted).
- All values in $\mu\text{g}/\text{m}^3$ except CO which is in mg/m^3 .
- The ozone standard is attained when the expected number of days per calendar year in which the maximum hourly average concentration is above the standard is equal to or less than one.
- Determined as geometric mean.
- Maximum 3-hour concentration not to be exceeded more than once per year in Air Quality Control Regions 127, 129 (Duluth - Superior Interstate AQCR), 130 and 132.
- The hydrocarbon standard is a maximum 3-hour concentration between 6:00 and 9:00 A.M. not to be exceeded more than once per year, corrected for methane.
- The hydrogen sulfide standard of $70 \mu\text{g}/\text{m}^3$ is not to be exceeded more than twice a year. The hydrogen sulfide standard of $42 \mu\text{g}/\text{m}^3$ is not to be exceeded more than twice in any five consecutive days.

In general, a PSD permit application must contain the following basic components¹:

- o An evaluation of alternative control devices and techniques demonstrating that Best Available Control Technology (BACT) will be applied to the new source
- o An analysis of existing ambient air quality in the area
- o A modeling analysis demonstrating that emissions from the project in conjunction with other nearby sources will not cause a violation of ambient air quality standards or PSD increments
- o An assessment of the sources' impact on soils, vegetation, and visibility
- o An analysis of the air quality impact associated with indirect growth created by the project

The basic components of a PSD permit application are briefly discussed below as they apply to the project.

Best Available Control Technology

The basic control technology requirement for new sources is the application and evaluation of BACT to include an emission limitation based on the maximum degree of contaminant reduction, taking into account energy, environmental, and economic impacts. BACT must be applied to all new major sources for those pollutants for which there will be a net significant increase in emissions. This level has been defined by the "significant emission rates" established by EPA (40 CFR Part 52.21). The evaluation of the proposed air pollution control system must include an analysis of alternative control systems capable of achieving a higher degree of emission reduction.

Existing Measured Air Quality

Generally, an application for a PSD permit must contain an ambient air quality analysis for each pollutant that a major new source, or major modification, would have the potential to emit in greater than significant amounts. Air quality data are obtained from a preconstruction monitoring program or, under certain conditions, from existing monitoring sites.

The ambient air quality analysis requirements of the PSD program may be waived on a pollutant-by-pollutant basis by the reviewing authority (here the MPCA) if either of the following conditions are met:

¹"Prevention of Significant Deterioration of Air Quality" (40 CFR Part 52.21).

- o The emissions of pollutants subject to PSD review will cause minimal ambient impacts as defined by the de minimis monitoring concentrations established by EPA (40 CFR Part 52.21)
- o Existing air quality in the source impact area is below the de minimis levels

Air Quality Impact Analysis

The PSD regulations limit the amount that air quality can be degraded above baseline levels. These allowable increases in concentrations (PSD increments) have been established for SO₂ and TSP only. The PSD increments (40 CFR Part 52.21) are a function of area categorization:

- o Class I - Areas where almost any deterioration of air quality is undesirable and little or no major industrial development is allowed
- o Class II - Areas where moderate, well-controlled energy or industrial growth is desired while complying with the NAAQS
- o Class III - Areas where substantial energy or industrial development is intended and the NAAQS are not violated

The project site is located in a Class II area. The nearest Class I area is the Rainbow Lake Wilderness Area which is located approximately 50 miles (80 kilometers) southeast of the site. There are no Class III areas to consider.

A dispersion modeling analysis must demonstrate that emissions from the proposed facility plus other increment consuming sources will result in concentrations that are less than the PSD increments. Once compliance with PSD increments has been determined, compliance with the NAAQS must be demonstrated. Total air quality levels are determined by combining the project concentrations with existing background levels. Background can be estimated through modeling of existing sources, from existing ambient measurements, or a combination thereof.

Impact on Air Quality-Related Values

The Clean Air Act amendments require that a new source review include an analysis of impacts on soils, vegetation, and visibility. The PSD program gives the Federal Land Manager of Class I PSD areas a role in reviewing new pollution sources to ensure that air quality-related values are not adversely impacted. Visibility is of particular significance where Class I areas are involved.

Air Quality Impact Associated With Indirect Growth

The PSD regulations require an analysis of the future air quality impact of the area as a result of growth associated with secondary emissions.

Secondary emissions are emissions from any offsite facility which is constructed or which increases its emissions as a result of the project being permitted.

4.1.1.3 Nonattainment Area Regulations

A major new stationary source, or major modification to an existing source, located in a nonattainment area, must obtain new source permits in accordance with EPA's nonattainment regulations¹. The new source review of a major source located in a nonattainment area requires: the achievement of the lowest achievable emission rate (LAER), certified compliance by all other sources in the state, emission offsets greater than one-for-one (or as otherwise provided in an approved SIP), and emission offsets providing a net air quality benefit to the nonattainment area. Major sources are subject to review under the Offset Ruling only if they emit in major amounts, i.e., 100 tons per year or greater for, the pollutant(s) for which the area is designated nonattainment.

The facility is located in a nonattainment area for TSP. However, nonattainment review requirements for TSP will not apply to this facility because its current potential to emit particulate matter is less than 100 tons per year, and the potential increases in particulate emissions are less than 100 tons per year. That is, the existing Hibbard Station is not a major particulate matter source and the potential increase is not major. To ensure that the facility will not increase particulate matter emissions above 100 tons per year, the facility will be equipped with an electrostatic precipitator (ESP) at a control efficiency equivalent to LAER.

4.1.1.4 New Source Performance Standards

The Clean Air Act mandated that the EPA promulgate New Source Performance Standards (NSPS), which are a set of national emission standards for stationary sources of air pollution.² These standards are applicable to specific categories of sources and apply not only to new sources, but also to modified or reconstructed existing sources of air pollution. These standards reflect the degree of emission limitation and percentage reduction in emissions achievable through application of the best technological system of emission reduction, as determined by EPA.

The EPA has promulgated NSPS for electric utility steam generating units for which construction begins after September 18, 1979 (40 CFR Part 60). The EPA has determined that the retrofit of the Hibbard Station is not subject to NSPS (ERT, 1985).

¹"Emission Offset Interpretative Ruling" (40 CFR Part 51, Appendix S)

²"Standards of Performance for New Stationary Sources" (40 CFR Part 60)

4.1.1.5 MPCA Air Pollution Control Regulations

The MPCA "Standards of Performance for New Indirect Heating Equipment" (Chapter 7005.0330) within the City of Duluth for capacities greater than 250 million Btu/hr restrict particulate matter to 0.1 lbs/million Btu; SO₂ to 1.2 lbs/million Btu for solid fuels and 0.8 lbs/million Btu for liquid fuels; and NO_x to 0.2 lbs/million Btu for gaseous fuels and 0.3 lbs/million Btu for liquid fuels. The same rules limit the visible emissions from air pollution sources to not more than 20 percent opacity; except that a maximum of 40 percent opacity shall be permissible for not more than two minutes in any 60-minute period.

The proposed facility must obtain a permit to construct from the MPCA prior to initiating construction. Generally, the information supplied as part of the PSD process is sufficient for the MPCA permit. The permit application must include site information, plans, descriptions, specifications, and drawings showing the design of the facility, the nature and amount of emissions, and the manner in which it will be operated and controlled.

4.1.2 Climatology

The Duluth area has a continental-type climate which is characterized by wide variations in temperature, ample summer rainfall, and moderate winter precipitation. Mean seasonal temperatures range from approximately 9°F in winter to 66°F in summer. Temperature extremes show a marked contrast with a record minimum of -39°F and maximum of 95°F. High and low pressure systems moving across the area cause frequent and often rapid changes in temperature, particularly in winter and spring. Maximum seasonal precipitation occurs during spring and summer. From May through September, the average total rainfall is about 18 inches, which accounts for approximately 60 percent of the annual total precipitation of approximately 30 inches. Winter precipitation consists mostly of snow, which averages about 78 inches a season. Thunderstorms are the principal source of precipitation in spring and summer. Thunderstorms accompanied by hail, and other severe storms (such as tornadoes, glaze, and blizzard conditions), occur often enough to warrant consideration in facility design and construction. Monthly mean temperature and precipitation data for the Duluth area are given in Table 4.1-2 (Ruffner, 1978).

The Duluth International Airport is located on a plateau at approximately 1400 ft. mean sea level (msl) and 13 kilometers (KM) to the northwest of the project site. The airport is also 9 KM west of Lake Superior and approximately 800 feet above lake elevation. The papermill is to be located along Duluth Harbor, at a base elevation of approximately 600 feet msl. More importantly, to the west, a bluff rises to over 1000 feet msl and extends extensively to the north and south.

The differences in topography and proximity to Lake Superior suggest that climatology may differ between the airport location and the project site. To address this possibility, wind speed and wind direction data from the Duluth International Airport and from the Minnesota Point Coast Guard Station at the north end of Duluth Harbor were obtained and analyzed. The results of this analysis, (ERT, 1985), indicate that at low levels, the

Table 4.1-2. Summary of Mean Monthly Climatological Conditions:
Duluth Area

Month	Mean Temperature ^a (°F)	Precipitation ^a (inches)	Snowfall ^b (inches)
January	8.5	1.16	16.6
February	12.1	0.85	12.0
March	23.5	1.76	13.6
April	38.6	2.55	7.2
May	49.4	3.41	1.0
June	59.0	4.44	T
July	65.6	3.73	0.0
August	64.1	3.79	T
September	54.4	3.06	T
October	45.3	2.30	1.3
November	28.4	1.73	10.1
December	14.4	1.40	16.2
Annual Mean	38.6	30.18	78.0

Source: Ruffner, 1978.

a. Period 1941-1970.

b. Period 1931-1960.

coastal environment of Duluth Harbor is strongly influenced by the terrain to the west and lake breezes. Prevailing winds are from the northeast, off of the lake. However, the Duluth airport data indicate that on the plateau west and northwest of Duluth, local meteorology is dominated by synoptic-scale events. Duluth airport windroses show a slight predominance of westerly winds, from the north-northwest radial to the southwest radial. Winds of approximately the same frequency occur from the southeast to easterly directions.

4.1.3 Emissions from Local Point Sources

Emission inventory data were obtained from the MPCA and the Wisconsin Department of Natural Resources (DNR) in order to identify other pollution sources in the vicinity of the project site and the Hibbard Station (ERT, 1985). Point sources located in Duluth and Carlton counties, Minnesota, and sulfur dioxide sources located in Superior, Wisconsin are listed in Table 4.1-3.

4.1.4 Existing Ambient Air Quality

The MPCA operates seven ambient air quality monitoring stations in the Duluth area that provide a good source of ambient monitoring data to characterize CO, Pb, SO₂, and TSP concentrations in the vicinity of the project site. Appropriate annual, highest and second-highest short-term concentrations for each pollutant monitored during the last three years (1982-1984) are listed in Table 4.1-4.

4.1.4.1 Sulfur Dioxide (SO₂)

Annual, as well as highest and second-highest 24-hour- 3-hour- and 1-hour-average SO₂ concentrations for MPCA monitor number 7576, are given in Table 4.1-4. Second-highest values are presented for the short-term averaging periods (<24 hours) because the standards allow one exceedence per calendar year. Maximum measured concentrations during these three years are 30 percent or less of the applicable NAAQS or Minnesota standard, well below the ambient standards.

4.1.4.2 Carbon Monoxide (CO)

Table 4.1-4 gives the highest and second-highest 8-hour and 1-hour average CO concentrations over the past three years for MPCA site 7526. The second highest 8-hour average concentration for 1984 is just at the primary NAAQS of 10 mg/m³, whereas the 1984 second highest 1-hour average concentration is 50 percent of the primary NAAQS and 57 percent of the more restrictive Minnesota state 1-hour standard. Elevated CO concentrations are primarily due to vehicular traffic on major roadways near the monitors, rather than from emissions from major stationary point sources, but are still below the ambient standards.

4.1.4.3 Lead (Pb)

Quarterly average lead concentrations for the past three years are given in Table 4.1-4 for MPCA site 7530. The highest of these is only 20 percent of the primary NAAQS, well below the ambient standards.

Table 4.1-3. Point Sources in Duluth and Carlton Counties, Minnesota, and Sulfur Dioxide Point Sources in Superior, Wisconsin

Source	Emissions (Tons/Year)				Location Relative to Hibbard Station	
	Suspended Particulate	Carbon Monoxide	Sulfur Dioxide	Nitrogen Dioxide	Distance (Km)	Azimuth Angle (degrees)
<u>Duluth County</u>						
Duluth Steam CO-Op ^a	21	12	758	408	6.6	39
Superwood Corporation ^a	11	38	184	60	5.1	35
International Multi-Foods ^a	778	0	0	0	4.7	47
Duluth Taconite-Missube ^a	37	0	0	0	2.2	35
U.S.S. Great Lakes Fleet ^{a, b}	2	6	42	30	5.2	53
Hallet Dock Company ^a	194	0	0	0	1.8	230
Kinsman Lines, Inc. ^{a, b}	59	5	73	14	1.8	28
C. Reiss Coal Company ^a	574	0	0	0	1.9	7
<u>Carlton County</u>						
Potlatch Corporation ^a	87	530	2093	503	21.4	266
Conwed Corporation ^a	96	8	302	168	24.9	267
Northern Natural Gas Co. ^a	3	25	0	65	23.4	231
<u>Superior, Wisconsin</u>						
CLM Corporation ^c			390		5.7	94
Murphy Oil Refinery ^c			2015		7.8	128
University of Wisconsin ^c			68		5.7	116

Source: ERT, 1985

- Sources whose emission rates are greater than significant emission rates, based on 1982 emission inventory data provided by MPCA.
- Emissions are due to ships releases while docked; these are not considered stationary point sources.
- Sources whose SO₂ emission rates are greater than 25 tons/yr, based on 1984 emission inventory data provided by Wisconsin DNR.

Table 4.1-4. Air Quality Monitoring Data for the Duluth Area
Over the Three-Year Period 1982 Through 1984

Pollutant	Averaging Time	MPCA Monitoring Station No.	Concentration ($\mu\text{g}/\text{m}^3$)					
			1982		1983		1984	
			Highest	2nd Highest	Highest	2nd Highest	Highest	2nd Highest
Sulfur dioxide	1-hour	7526	201.6	183.3	130.9	117.8	235.7	183.3
	3-hour	7526	112.6	110.0	99.5	91.7	151.9	138.8
	24-hour	7526	91.7	68.1	52.4	49.8	86.4	75.9
	annual	7526	18.3 ^a	-	15.7	-	18.3	-
Carbon monoxide	1-hour	7526	19,540	19,540	17,816	16,667	25,287	20,115
	8-hour	7526	11,609	11,149	10,460	9,540	16,207	10,000
Lead	quarterly	7530	0.23	-	0.30	-	0.19	-
Particulate	24-hour	7536	67	61	126	70	81	71
		7537	549	291	209	174	58	55
		7538	116	97	133	88	143	133
		7530	103	98	120	115	155	133
		7541	81	75	242	68	69	59
		7543		(b)		(b)	922	447
	annual	7536	20.5	-	23.7	-	23.2	-
		7537	67.2	-	53.6	-	40.1	-
		7538	34.7	-	32.9	-	39.7	-
		7530	42.4	-	44.7	-	55.7	-
		7541	25.0	-	27.8	-	24.9	-
		7543		(b)		(b)	91.1	-

Source: MPCA, 1985.

a. Data capture below 75 percent.

b. Not in operation.

4.1.4.4 Total Suspended Particulates (TSP)

Annual, highest and second-highest 24-hour TSP concentrations for all six TSP monitoring sites are listed in Table 4.1-4. The latest (1984) available data show that the 24-hour TSP primary standard of $260 \text{ } \mu\text{g}/\text{m}^3$ is violated at MPCA site 7543 and the secondary standard of $150 \text{ } \mu\text{g}/\text{m}^3$ is exceeded once at MPCA site 7530. The annual TSP primary standard of $75 \text{ } \mu\text{g}/\text{m}^3$ is violated at MPCA site 7543. These monitors designate areas of TSP nonattainment in the vicinity of the Hibbard Station. The remaining TSP monitors all show attainment with appropriate standards.

4.1.4.5 Ozone (O_3)

There are no ozone monitors in the City of Duluth. The closest O_3 monitoring site is located in Roseville. The second-highest 1-hour average O_3 concentration at this site over the past three years is $185 \text{ } \mu\text{g}/\text{m}^3$ which is 78 percent of the $235 \text{ } \mu\text{g}/\text{m}^3$ primary and secondary NAAQS. Since Roseville is within the Minneapolis-St. Paul metropolitan area, the concentration level at the Roseville monitor is considered conservative or higher than what would be expected in Duluth, but still below the ambient standards.

4.1.4.6 Nitrogen Dioxide (NO_2)

There are no NO_2 monitors in the city of Duluth. The closest NO_2 monitoring sites are located in Minneapolis, St. Paul, Roseville, Sherburne County and Wright County. The highest monitored annual NO_2 concentration for these areas is $35.8 \text{ } \mu\text{g}/\text{m}^3$ which occurred in Roseville. This concentration is 36 percent of the NAAQS of $100 \text{ } \mu\text{g}/\text{m}^3$, which is well below the ambient standards.

4.1.5 Odor Conditions

Odor is a sensation which results from the interaction of certain chemical substances with the olfactory system. An odor threshold is defined as the concentration of a particular odorant species above which the odor is recognized by a significant portion of the population. Concentrations of an odorant chemical substance below this point are generally not considered to cause odorous impacts.

4.1.5.1 Odor Regulations

Minnesota has developed regulations for the control of odors in the ambient air. These regulations establish odor emission limits which are based on ambient odor testing. The regulations are set forth in "Standards of Performance for Odorous Emission," Minnesota Rules, Parts 7005.0900 through .0960. Emission limits set forth by the above regulations essentially restrict the impact of odorous emissions on residential areas to a barely detectable concentration.

4.1.5.2 Current Conditions

There are no sources of objectionable odors currently located on the site. However, an area to the west of the site does experience some odor excursions. Wastewater effluent from the Potlatch papermill in Cloquet is

the water quality report. The water quality report also includes information on the water quality of the water supply. The water quality report also includes information on the water quality of the water supply.

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Typically occur near the WLSSD treatment plant. The closest WLSSD is the closest WLSSD. WLSSD is the closest WLSSD. WLSSD is the closest WLSSD.

In the past, primary contribution from Potomac River odor excursion system has been observed.

West of the project approximately 200 feet from I-35 (I-35) is the WLSSD sewage treatment plant. The WLSSD sewage treatment plant is located to the west of the residences. The WLSSD sewage treatment plant is located to the west of the residences. The WLSSD sewage treatment plant is located to the west of the residences.

4.1 References

Environmental Research & Technology, Inc., 1985. Duluth Paper Mill - Air Quality, prepared for PNTA-MPL, Concord, MA.

ERT, see Environmental Research & Technology Inc.

Ruffner, James A., 1978. Climates of the States, Volume 1, Gale Research Company, Detroit, MI.

Stepun, J., 1985. Telephone conversation between Stepun, WLSSD, and R. Andes, NUS Corporation, about odors from pumping stations, December 5.

List of Statutes and Regulations

"Emission Offset Interpretative Ruling," 40 CFR Part 51, Appendix S.

"Minnesota Ambient Air Quality Standards," Chapter 7005.

"Minnesota Standard of Performance for New Indirect Heating Equipment," Chapter 7005.0330.

"National Primary and Secondary Ambient Air Quality Standards," 40 CFR Part 50.

"Prevention of Significant Deterioration of Air Quality," 40 CFR Part 52.21.

"Standards of Performance for New Stationary Sources," 40 CFR Part 60.

"Standards of Performance for Odorous Emission," Minnesota Rules, Chapter 7005 - Minnesota Pollution Control Agency, Air Quality Division: Air Pollution Control. As amended and revised through April 16, 1984.

4.2 SURFACE WATER

The existing hydrologic, water quality, water supply, and wastewater collection and treatment conditions which apply to the project site are described in this section. The project site is adjacent to or near several surface water bodies (Figure 4.2-1). The site is on the northern bank of the St. Louis River, at the upstream end of St. Louis Bay. The St. Louis River flows through two bays or harbors before it discharges into Lake Superior. St. Louis Bay, or the Duluth-Superior inner harbor, lies between the former Arrowhead Bridge at the upstream end and the Interstate 535 Bridge (Blatnik High Bridge) on the downstream end, a distance of approximately three miles.

St. Louis Bay flows into Superior Bay, or the Duluth harbor. Superior Bay is approximately nine miles in length, oriented along the shore of Lake Superior. This bay is separated from Lake Superior by a long narrow barrier island, with connections from the bay to the lake at two inlets.

The project site itself is crossed by Keene Creek, a small tributary to the St. Louis River. Keene Creek crosses the southern part of the site and discharges into the St. Louis River a short distance upstream of the former Arrowhead Bridge. Keene Creek is a Minnesota Department of Natural Resources designated trout stream.

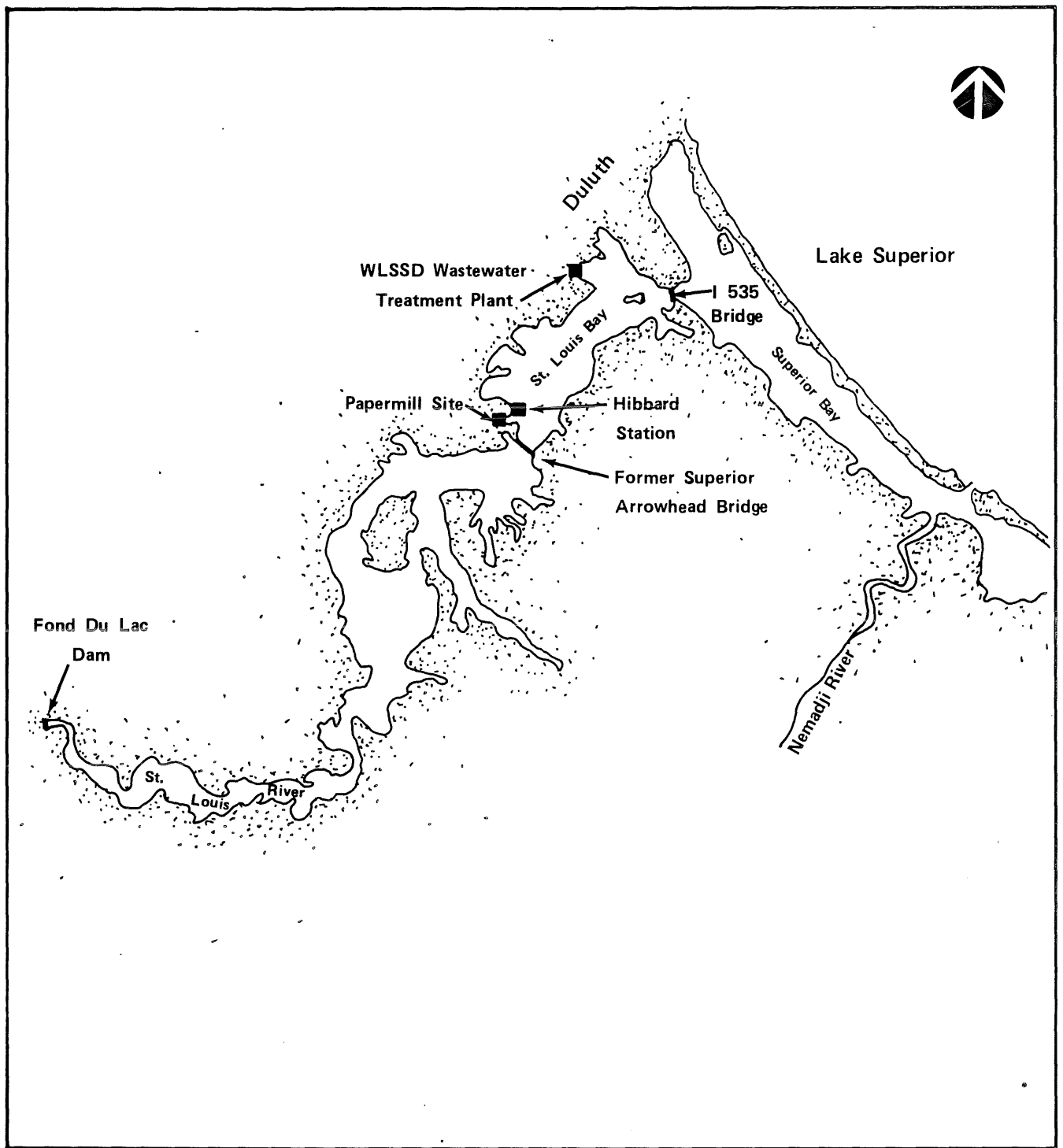
Adjacent to the site is the currently nonoperating Hibbard Station. The Hibbard Station is located on a peninsula in the upper reach of St. Louis Bay to the east of the site. Wastewaters generated at the site and at Hibbard Station will be sent to the Western Lake Superior Sanitary District (WLSSD) wastewater treatment plant. The WLSSD plant is located approximately 2.5 miles downstream of the site on a peninsula into St. Louis Bay. Treated effluent from the wastewater treatment plant is discharged to St. Louis Bay.

4.2.1 Surface Water Hydrology

Rainfall runoff from the site is drained by Keene Creek or direct flow into St. Louis Bay. The City of Duluth Department of Water and Gas maintains storm sewers on and adjacent to the site. Stormwater is collected via surface drains and sewers and discharged to Keene Creek and the St. Louis River. Keene Creek is a relatively small waterway. Its width ranges between approximately 10 and 15 feet and its depth between 1 and 3 feet on the site. Lindskov (1977) reports a low-flow measurement of less than 1 cubic foot per second (cfs) taken in 1974; however, regular measurements of Keene Creek stream flow are not made.

The Lake Superior seiche can transport water into Superior Bay and St. Louis Bay and also reverse flow in the St. Louis River up to Fond du Lac Dam. Because the nearest U.S. Geological Survey (USGS) gaging station (No. 04024000) is located above Fond du Lac Dam, flows recorded at the station are not necessarily indicative of flows in the site vicinity. The station is located in Scanlon, Minnesota and is approximately 23 miles upstream of the project site.

The average flow at the Scanlon gaging station is 2313 cfs during the period of record (1908-present). Extremes during this period were a high flow of



Not to Scale

Surface-Water Bodies in Vicinity of the Project

Figure 4.2-1

37,900 cfs measured in 1950 and a low of 54 cfs measured in 1980 (USGS, 1984). Water quality impacts are often assessed in terms of a particular low-flow statistic, the once-in-ten-year seven-consecutive-day low-flow (7Q10). The 7Q10 value for the St. Louis River at Scanlon is 348 cfs (Lindskov, 1977).

The flow rate across the width of the river is probably quite variable due to irregularities of the shoreline, especially in the Duluth area where the river widens to form St. Louis Bay. For example, the constricted entry and exit of St. Louis Bay will likely affect the flow and mixing characteristics at the site, the Hibbard Station, and the WLSSD wastewater treatment plant. The dispersion and mixing of discharges will be influenced by such flow effects.

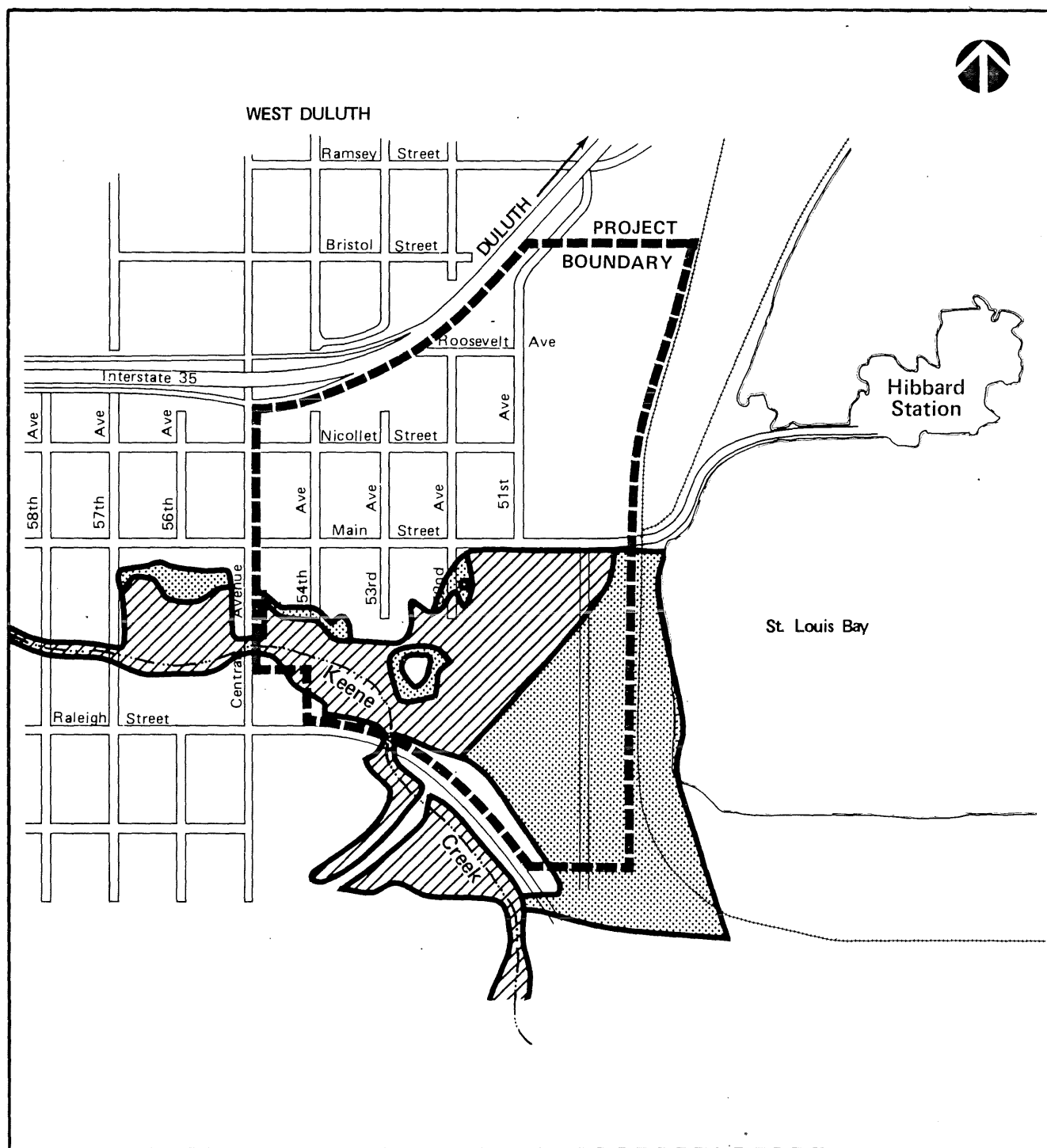
There is some potential for flooding on the site. Storm surge and seiche on Lake Superior can cause an elevation of the lake water surface above normal. Riverine flooding due to high streamflows creates additional potential for flooding. Flood stage studies for Duluth have shown that there is a potential for flooding during extreme flood events (100-year flood) along Keene Creek and in the mid-section of the site (Figure 4.2-2).

Zoning ordinances of the City of Duluth recognize various flood zones, including a floodway district, a flood fringe, and a general floodplain district ("Water Resource Management" Duluth City Code Chapter 51). The floodway district is technically determined as the part of the 100-year floodplain in which filling or other floodplain encroachment would cause a rise in the 100-year flood elevation by more than 1 foot. The Duluth City Code prohibits filling, storage of materials or equipment, and erection of structures in the floodway district without a special permit and then under strict standards.

The flood fringe district corresponds to the remainder of the 100-year floodplain (that is, the 100-year floodplain outside of the floodway district). The Duluth City Code prescribes standards for use of flood fringe district land. Generally, structures must be placed on fill above the elevation of the 100-year floodplain and must be floodproofed.

General floodplain districts are areas within the 100-year floodplain, but which cannot be designated as either floodway or flood fringe areas due to insufficient data. The Duluth City Code specifies a procedure wherein the city engineer will make an evaluation of a proposed use of general floodplain land and determine a classification as either floodway or flood fringe. The Duluth City Code does not regulate land use outside of the 100-year floodplain.

Flood zones in the vicinity of the project site are shown in Figure 4.2-3. Keene Creek is designated as a floodway and its 100-year flood overflow areas a flood fringe. The flood fringe covers a significant portion of the site south of Main Street and east of 53rd Street. Floodway areas are limited to a minor portion of the site along the southern property boundary. General floodplain district areas occur near the Hibbard Station and along the St. Louis Bay shoreline, but not on the site proper.



Legend

-  100 - Year Floodplain
-  500 - Year Floodplain

Source: FEMA, 1982

0 100 300 500 Feet

100 - and 500 - Year Floodplains

Figure 4.2-2

4.2.2 Water Quality

The water quality of St. Louis Bay is affected by the industrial and urban land uses that surround it. The bay is used as a harbor for shipping on the Great Lakes. The bay receives wastewaters from municipal and industrial dischargers, nonpoint source pollutants, shipping wastes and harbor dredging operations. Nevertheless, changes in area-wide wastewater treatment have demonstrably improved water quality over recent years (MPCA, 1980).

St. Louis Bay has been the subject of numerous water quality studies over the years (Carlson and Thomas, 1984; Devore, 1983; MPCA, 1984; Upper Lakes Reference Group, 1977). A major focus has been the influence of the flow from the bay into Lake Superior. Lake Superior is an international water body of high water quality and low eutrophication potential. Critical to the continued high water quality of the lake is a low input of nutrients that could encourage algal growth and other unpleasant conditions typical of eutrophication. The influx of toxic materials that persist in the lake is another area of concern. The St. Louis River is the third largest tributary to Lake Superior, and thus a significant influence upon the lake's water quality (Carlson and Thomas, 1984).

4.2.2.1 Water Quality Classification

The State of Minnesota classifies surface water according to applicability for various uses. The major use categories are: domestic consumption, fisheries and recreation, and industrial consumption. Within each use category, streams and lakes are defined as Class A, B or C; with A the highest uses and C the lowest. Minnesota stream standards classify St. Louis Bay as 2B and 3B; that is, Class B for fisheries and recreation and Class B for industrial consumption ("Minnesota State Water Quality Standards," Minnesota Code of Agency Rules, MCAR 6:4.8014). The Bay is not classified for domestic consumption. Class 2B waters must be of sufficient quality to support warm and cool (but not cold) water fisheries and all water recreation including bathing. Class 3B waters are suitable for industrial use after moderate treatment.

Keene Creek is classified under Minnesota standards as 1B, 2A and 3B. Class 1B waters are suitable for domestic consumption (drinking water) after normal disinfection. Class 2A waters support cold water fisheries (that is, trout fisheries) and primary and secondary contact recreation (swimming and boating). Class 3B industrial consumption standards are the same as those for St. Louis Bay. Numerical water quality standards are associated with the various stream classifications. Pertinent standards are summarized in Table 4.2-1.

4.2.2.2 Historical Water Quality

St. Louis Bay has a history of water quality problems that have largely been corrected since the WLSSD treatment plant commenced operation in 1978. Prior to the WLSSD plant, approximately nine separate facilities treated and discharged wastewater to the lower St. Louis River system, often creating undesirable water quality conditions (MPCA, 1977). During the period 1973 to 1975, for example, fecal coliform levels reached 230,000 most probable number per 100 milliliters (MPN/100 mL), 5-day biochemical oxygen demand

Table 4.2-1. Minnesota State Water Quality
Standards for Selected Constituents

Parameter	Units	Standard by Stream Class ^a			
		1B	2A	2B	3B
Dissolved oxygen	mg/L	--	>7	>5	--
Fecal coliform	No./100 mL	1 ^b	200 ^c	200 ^c	--
Ammonia (unionized)	mg/L as N	--	0.016	0.04	--
Chlorides	mg/L	250	50	--	100
Oil	mg/L	--	0.5	0.5	--
pH	standard units	--	6.5-8.5	6.5-9.0	6.0-9.0
Surfactants	mg/L MBAS	0.5	--	--	--
Turbidity	standard units	5	10	25	--
Color	standard units	15	30	--	--
Total dissolved solids	mg/L	500	--	--	--
Hardness	mg/L	--	--	--	250
Arsenic	mg/L	0.01	--	--	0.05
Copper	mg/L	1	0.01 ^d	0.01 ^d	--
Cyanides	mg/L	0.01	0.02	0.02	0.2
Fluorides	mg/L	1.5	--	--	1.5
Iron	mg/L	0.3	--	--	--
Manganese	mg/L	0.05	--	--	--
Nitrates	mg/L as NO ₃	45	--	--	--
Phenol	mg/L	0.001	0.01 ^e	0.01 ^e	--
Sulfates	mg/L	250	--	--	--
Zinc	mg/L	5	--	--	--

Table 4.2-1. Minnesota State Water Quality
Standards for Selected Constituents (Continued)

Parameter	Units	Standard by Stream Class ^a			
		1B	2A	2B	3B
Barium	mg/L	1	--	--	1
Cadmium	mg/L	0.01	--	--	0.01
Chromium (hexavalent)	mg/L	0.05	0.02	0.05	0.05
Lead	mg/L	0.05	--	--	0.05
Selenium	mg/L	0.01	--	--	0.01
Silver	mg/L	0.05	--	--	0.05
Total residual chlorine	mg/L	--	0.005	0.005	--

Source: Part 7070.0220 (6 MCAR 4)

- a. All standards are values not to be exceeded except dissolved oxygen.
- b. Most probable number.
- c. Logarithmic mean of five or more samples during month.
- d. Copper standard must not be greater than 0.1 times the 96-hour TLM.
- e. None that could impart taste or odor to fish flesh.

(BOD5) reached 27 milligrams per liter (mg/L) and dissolved oxygen dropped as low as 4.4 mg/L (MPCA, 1980). Applicable stream standards for these constituents are less than 200 MPN/100 mL for fecal coliform and greater than 5 mg/L for dissolved oxygen. There is no specific criterion for BOD5, however 27 mg/L is a very high value for surface waters.

Since opening of the WLSSD treatment plant, stream water quality in St. Louis Bay has improved dramatically. Dissolved oxygen is consistently greater than the stream standard and typically much higher. BOD5 is generally less than 2 mg/L and fecal coliform violations are rare. A summary of water quality data for St. Louis Bay for the period October 1980 through September 1984 is included as Table 4.2-2. These samples are largely restricted to conventional water quality parameters.

Toxic materials in water quality are not measured as frequently as conventional parameters and were, until recently, a less widely recognized water quality problem. Toxics are a known problem in the St. Louis Bay. The 1985 fish consumption advisory published by the Minnesota Department of Health states that the consumption of fish caught in St. Louis Bay should be limited due to contamination by mercury and PCBs (MDH, 1985). Available data are included in Table 4.2-2. Measurements taken in 1973 to 1975 and reported in the Minnesota Draft Environmental Impact Statement for Arrowhead Bridge (MDOT, 1979) are reproduced in Table 4.2-3. These data are included only to indicate the possible range of toxic pollutant concentrations. Actual concentrations are likely much less today due to the improvement in water quality since construction of the WLSSD treatment plant. The improvement in water quality may be seen in the decrease in concentrations of copper, zinc and lead from 1973-1975 (Table 4.2-3) to 1980-1984 (Table 4.2-2).

Keene Creek has been sampled periodically since 1975. Three Keene Creek and two onsite locations were sampled in September 1985. The onsite locations included a stormwater culvert and a pond at the south end of the site. Results from samples collected on September 23, 1985 are included as Table 4.2-4. Sampling locations are shown on Figure 4.2-4. Fecal coliform values in Keene Creek are somewhat high, probably due to nonpoint source runoff. Otherwise, there are no significant water quality problems apparent in the creek. The Keene Creek values obtained in the 1985 sampling are consistent with historical values, tabulated in Table 4.2-5. Samples collected on the site show elevated concentrations of fecal coliform, oil and grease, total dissolved solids and lead. Thus, from at least some sections of the property, nonpoint source pollution sources appear to cause violations of applicable water quality standards.

4.2.3 Water Supply

The project will require 3.5 to 4.0 million gallons per day (mgd) of water for the papermill that will be supplied via the existing Hibbard Station intake structure. The station has a Minnesota Department of Natural Resources (MDNR) water appropriations permit (Permit No. 82-2041) which allows for the withdrawal of up to 235.9 mgd from the St. Louis River. Additional water for potable use at the mill and station and for boiler makeup at the power plant will be provided via the City of Duluth's municipal system, under the jurisdiction of the Duluth Gas and Water Department. This system withdraws water from Lake Superior and presently

Table 4.2-2. Observed Water Quality of St. Louis Bay,
October 1980 through September 1984

Parameter	Units	Number of Observations	Minimum	Maximum	Average
Temperature	degrees C	36	0	24	12
Dissolved oxygen	mg/L	36	6.4	13.0	9.5
5-day BOD	mg/L	36	<0.5	2.2	1.3
Fecal coliform	No./100 mL	34	<20	35,000	220 ^a
Total suspended solids	mg/L	36	1.6	26.0	11.0
pH	standard units	36	6.7	8.0	7.6 ^a
Conductivity	micromhos	36	100	250	160
Total phosphorus	mg/L as P	36	0.037	0.130	0.077
Kjeldahl nitrogen	mg/L as N	36	0.49	1.30	0.91
Sulfates	mg/L as SO ₄	1	--	--	17.0
Arsenic	eg/L	2	1	1	--
Copper	eg/L	2	2	3	--
Zinc	eg/L	2	4	5	--
Cadmium	eg/L	2	0.03	0.1	--
Chromium (total)	eg/L	2	4	5	--
Mercury	eg/L	2	<0.1	0.2	--
Lead	eg/L	2	1	2	--
Nickel	eg/L	2	1	2	--

Source: MPCA, 1983, 1985.

a. Median value, all other values are arithmetic mean.

Measuring location: I-535 Bridge, Superior Bay side (See Figure 4.2-1).

Table 4.2-3. Observed Water Quality of St. Louis Bay,
1973 Through 1975^a

Parameter	Units	Minimum	Maximum
Total phosphorus	mg/L as P	<0.01	0.19
Ammonia	mg/L as N	<0.05	0.57
Total nitrogen	mg/L as N	0.26	2.16
Chloride	mg/L	2	23
Oil and grease	mg/L	0.8	3.4
Arsenic	μg/L	<10	<10
Copper	μg/L	<10	79
Cyanide	mg/L	<0.005	0.006
Fluoride	mg/L	<0.1	1.1
Iron	mg/L	0.47	2.3
Manganese	μg/L	<10	300
Phenol	μg/L	3	23
Sulfate	mg/L as SO ₄	<5	35
Zinc	μg/L	<10	740
Cadmium	μg/L	<10	<10
Lead	μg/L	<10	32
Selenium	μg/L	<2	<2

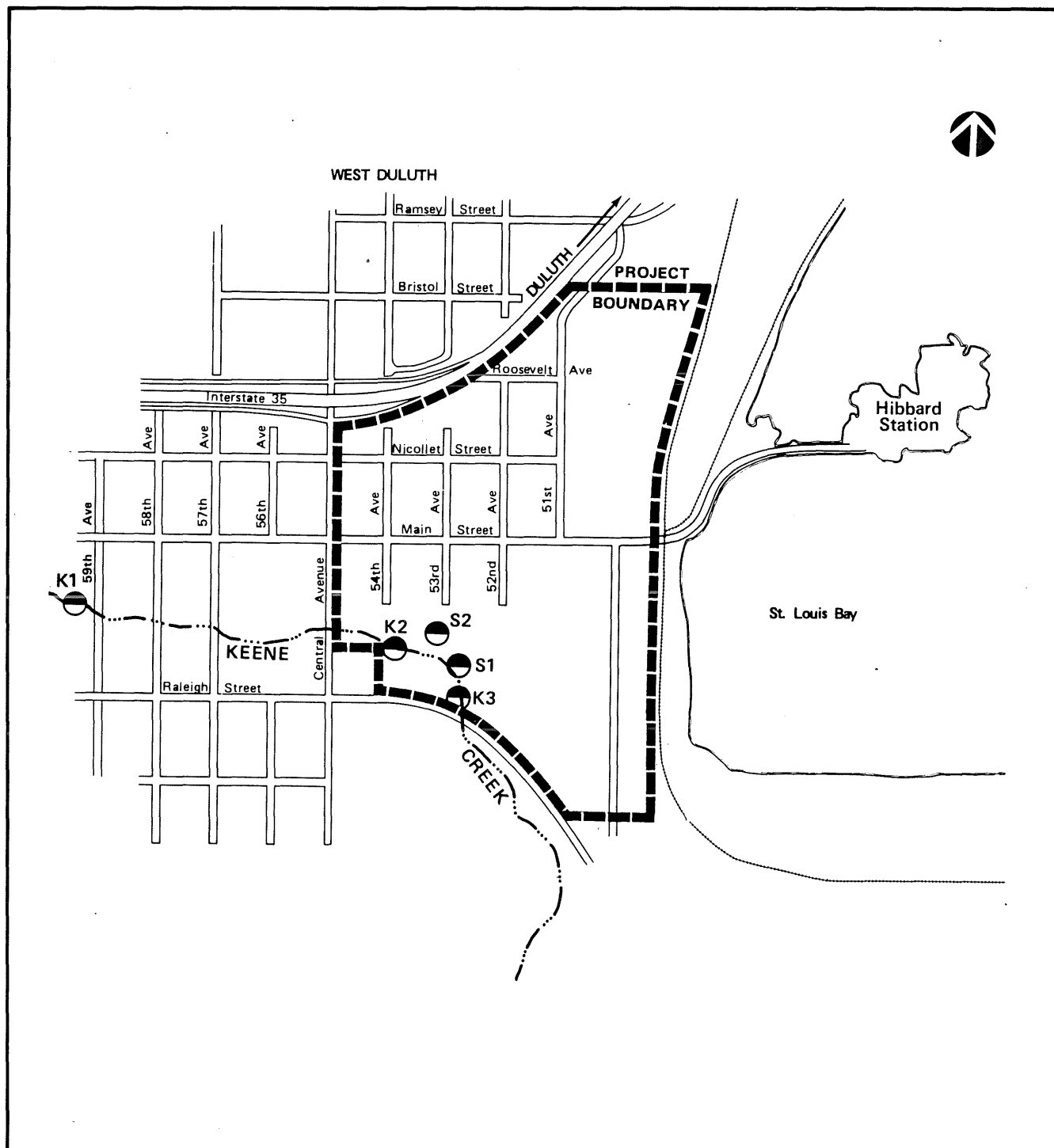
Source: MDOT, 1979.

a. Measuring location: I-535 Bridge (see Figure 4.2-1).

Table 4.2-4. Keene Creek and Onsite Surface Water Quality
September 23, 1985^a

Parameters	Units	Keene Creek Stations			Onsite Stations	
		No. K1	No. K2	No. K3	No. 51	No. 52
5-day BOD	mg/L	<2.0	<2.0	<2.0	5.0	<2.0
Total coliform	No./100 mL	6900	3600	6700	>200,000	400
Ammonia	mg/L as N	0.32	0.19	0.23	0.30	0.15
Chlorides	mg/L	16.6	16.5	17.2	11.6	12.9
Oil and grease	mg/L	<1	<1	<1	2	2
pH	Standard Units	7.9	7.9	7.9	7.40	7.35
Total suspended solids	mg/L	42	43	44	162	6
Total dissolved solids	mg/L	151	147	151	115	162
Conductivity	micromhos/cm	184	185	190	142	238
Total hardness	mg/L	85	85	86	65	101
Arsenic	µg/L	<5	<5	<5	<5	<5
Copper	mg/L	0.01	0.01	0.02	0.02	0.01
Iron	mg/L	1.3	1.0	1.5	2.67	1.4
Manganese	mg/L	0.083	0.06	0.092	0.29	0.58
Nitrate	mg/L as N	0.07	0.07	0.07	0.19	0.04
Sulfates	mg/L	9	8	9	11	14
Zinc	µg/L	30	30	44	73	20
Barium	µg/L	<50	<50	<50	<50	<50
Cadmium	µg/L	<0.2	<0.2	<0.2	0.3	<0.2
Chromium (total)	µg/L	<50	<50	<50	<50	<50
Lead	µg/L	14	8	20	51	7
Nickel	µg/L	<30	<30	<50	<30	<30
Selenium	µg/L	<5	<5	<5	<5	<5
Silver	µg/L	<20	<20	<20	<20	<20

a. Sampling and analysis by Minnesota Power Company. Station locations are shown on Figure 4.2-4.



Legend

-  K1 Keene Creek Sampling Station
-  S1 On-Site Surface - Water Sampling Station

Source: ERT, 1985.

0 100 300 500 Feet

Surface - Water Quality Sampling Stations on or Adjacent to the Project Site

Figure 4.2-4

Table 4.2-5. Observed Water Quality of Keene Creek
1975 through 1985^a

Parameter	Units	Number of Observations	Minimum	Maximum	Average
Temperature	degrees C	12	2	23	13.5
Dissolved oxygen	mg/L	11	4.8	13.2	8.8
5-day BOD	mg/L	12	<1.0	3.2	1.7
Fecal coliform	No./100 mL	14	50	20,000	1860
Chloride	mg/L	5	14	28	22
Total suspended solids	mg/L	5	<1	8	3
pH	standard units	5	7.4	8.4	--
Conductivity	micromhos/cm	4	220	1,210	490
Turbidity	FTU	4	1.0	14.0	5
Color	Pt-Co units	4	30	90	64
Total phosphorus	mg/L as P	14	0.009	0.088	0.040
Kjeldahl nitrogen	mg/L as N	5	0.06	0.99	0.63
Sulfates	mg/L as SO ₄	5	10	17	13
Copper	eg/L	3	<10	11	--
Zinc	eg/L	3	<10	38	--
Cadmium	eg/L	3	<5	<10	--
Chromium (total)	eg/L	3	<5	<10	--
Nickel	eg/L	3	<10	<10	--

Source: U.S. EPA, 1985.

a. Measuring location not indicated

supplies a total of 16 to 20 mgd to four municipalities. The water supply is currently treated using flocculation/coagulation, sedimentation, and filtration prior to distribution. The anticipated demand of this project for potable water from the municipal system is 0.3 mgd (208 gallons per minute).

4.2.4 Wastewater Collection and Treatment

The project will use existing wastewater collection and treatment facilities provided by the Western Lake Superior Sanitary District (WLSSD). These include the interceptor sewer that carries wastewater flows from areas west of the City of Duluth to the advanced regional wastewater treatment plant. The WLSSD treatment plant is located approximately 2.5 miles to the north of the project site at 27th Avenue West and the waterfront.

The interceptor network and treatment plant presently serve ten municipalities and three major industries in the project area. The total system contains 13 pump stations, 6 metering stations, 12 sampling stations and over 50 miles of interceptors.

The WLSSD Wastewater Treatment Facility was completed in 1978. The plant was designed to handle an average flow of 43.63 mgd and a peak flow of 86.57 mgd. The ultimate design loadings to the plant were 97,658 pounds per day (lbs/day) of five-day biochemical oxygen demand (BOD5), 61,896 lbs/day of total suspended solids (TSS), and 1100 lbs/day of total phosphorus (P). The ultimate plant wastewater flows and loads were based on the 1990 design population projected for the Duluth area (Consoer, Townsend & Assoc., 1979). It should be noted that the 1990 design projections are not valid. Municipal growth has actually been much lower than originally projected, and industrial loadings have reduced with time due to plant closings and pre-treatment. The net result is the current excess capacity. The WLSSD facility treats raw wastewater biologically (to remove organic matter and nutrients), chemically (to remove phosphorus), and physically by filtration (to remove fine solid particles). The plant utilizes the following unit operations and processes:

- o Bar screens
- o Grit chambers
- o Pure oxygen activated sludge
- o Clarifiers
- o Clari-flocculators
- o Multi-media filters
- o Chlorination/dechlorination
- o Dissolved air flotation thickeners
- o Belt filter presses
- o Sludge incineration

In addition to the wastewater treatment operations, the WLSSD plant was designed for disposal of municipal refuse. The refuse is used as the fuel source for the incineration of the wastewater sludge.

Currently, the WLSSD plant is operating at an average flow of 33.936 mgd (78 percent of design) and treating an average of 53,839 lbs/day of BOD5 (55 percent of design), 29,287 lbs/day of TSS (47 percent of design), and 718 lbs/day of total P (65 percent of design) (Stepun, 1985).

The WLSSD has had a sewer ordinance since 1977 that requires and regulates the use of public sewers and private wastewater disposal facilities. It has recently enacted an industrial pretreatment ordinance that sets forth uniform requirements for industrial waste discharges into the district's sewerage system, so that the WLSSD would comply with the permit requirements under the National Pollution Discharge Elimination System (NPDES) and the provisions of the applicable state and federal laws required by the Clean Water Act of 1977, as amended, and the General Pretreatment Regulations (40 CFR Part 403). This ordinance provides for the regulation of discharges into the District sewerage system through the enforcement of administrative regulations while also authorizing monitoring and enforcement activities, establishing industrial reporting requirements, and providing for establishment of penalties for violation of the pretreatment rules and regulations (WLSSD, 1985a,b).

The WLSSD treatment plant discharges to St. Louis Bay in compliance with the requirements of its NPDES permit (No. MN 0049786) which expires October 31, 1989. The effluent limits and monitoring requirements are provided in Table 4.2-6. The WLSSD provides the Minnesota Pollution Control Agency (MPCA) with a monthly report that details the effluent characteristics and plant operations. Table 4.2-7 provides a summary of WLSSD effluent quality and NPDES permit requirements.

Table 4.2-6. Effluent Limitations and Monitoring Requirements for WLSSD Treatment Facility

Effluent Characteristics	Continuous Discharge Limitations	
	Seven Consecutive Day Average	Thirty Consecutive Day Average
5-Day carbonaceous biochemical oxygen demand ^{a, b}	40 mg/L, 14555 lb per day	25 mg/L, 9097 lb per day
Total suspended solids ^{a, b}	45 mg/L, 16,374 lb per day	30 mg/L, 10,916 lb per day
Fecal coliform group organisms ^{c, d, e}		200 organisms/100 mL
Turbidity ^a	NA	25 NTU
Total phosphorus ^a	NA	1 mg/L, 364 lbs per day
Precipitation	Daily	
Influent flow	Continuous	

The pH shall not be less than 6.0 nor greater than 9.0. These upper and lower limitations are not subject to averaging and shall be met at all times.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

The discharge shall not contain oil or other substances in amounts sufficient to create a visible color film on the surface of the receiving waters.

Source: NPDES Permit No. MN 0049786

- a. Arithmetic mean
- b. For the thirty consecutive day average, the effluent concentrations shall not exceed the stated value or 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same time during the same period (most restrictive values)
- c. Geometric mean
- d. 10 percent of all samples taken during any calendar month shall not exceed 400 organisms/100 mL.
- e. Applicable from April 16 to October 31

Table 4.2-7. Summary of WLSSD Effluent Quality
for January through June, 1985

Parameter	Units	NPDES Permit Value ^a	Average ^a	Minimum ^a	Maximum ^a
BOD5	mg/L	25.0	9.0	2.0	75.0
TSS	mg/L	30.0	4.75	1.0	78.0
Total P	mg/L	1.0	.81	.16	3.19
pH	S.U.	6.0-9.0		6.00	7.40
DO	mg/L		6.3	2.8	8.5
Turbidity	NTU	25.0	10	<1	95
Fecal coliform	No./100mL	200 ^b	1,300 ^b	<10	2,000,000
Temperature	°C		20	13	26

Source: ERT, 1985.

- a. Values are 6-month average and 6-month maximum or minimum.
- b. Geometric mean.

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Statutes and Regulations

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"Pulp, Paper, and Paperboard Point Source Category," 40 CFR Part 430.

"Water Resource Management", Duluth City Code, Chapter 51.

4.3 NOISE

In order to assess the potential for noise impacts due to construction and operation of the project, existing noise conditions were measured at selected locations near the site. The following sections contain a description of the noise regulations that influenced the selection of the monitoring locations, an explanation of the terminology and results of the measurements, and a comparison of the existing noise conditions with the standards.

4.3.1 Noise Standards

There are no federal noise regulations that apply to the operation of the proposed project. Similarly, the city of Duluth has no comprehensive noise regulations nor formal enforcement programs. Noise problems that do arise are handled under public nuisance laws (Smedberg, 1986). Thus, only state regulations apply to the proposed project. Table 4.3-1 presents the current Minnesota noise standards established by the Minnesota Pollution Control Agency ("Noise Pollution Control Rules," Minnesota Rules Part 7010.0400). Increases of up to 2dBA above the standards are considered to be in compliance with the regulations. These standards describe the limiting levels of sound established to preserve public health and welfare. Acceptable sound levels vary according to three factors:

- o The time of day. Night standards (10 P.M. to 7 A.M.) are more stringent than daytime standards (7 A.M. to 10 P.M.).
- o The land use activity in the receiving area. Land uses are divided into four noise area classifications (NACs), but noise standards have been developed for only three area classifications. Uses most sensitive to noise are classified as NAC-1 (typically residential in nature) and have the most stringent noise standards.
- o The duration and intensity of the noise. The two duration-intensity descriptors are L_{10} and L_{50} . An L_{10} standard is a dBA sound level that cannot be exceeded for more than 10 percent of the time in a 1-hour survey. An L_{50} standard is a dBA sound level that cannot be exceeded more than 50 percent of the time in a 1-hour survey.

The dBA unit of measurement means the sound levels (in decibels) have been weighted, or filtered, so as to simulate the response of the human ear. The MPCA standards are consistent with speech, sleep, annoyance, and hearing conversation requirements for receivers within the applicable NAC classifications. The NAC classifications are receiver standards. For example, if a NAC-3 and NAC-1 activity are located side-by-side, the NAC-1 standards would be applicable to the receiver.

A proposal currently being considered by the MPCA would change Minnesota's noise regulations to an energy equivalent noise standard: L_{eq} . L_{eq} is a long-term, A-weighted, sound level which is equal to the level of a steady-state continuous noise having the same energy as the time-varying noise, for a given situation and time period (typically 1-hour).

Table 4.3-1. Summary of Minnesota Pollution Control Agency (MPCA)
Noise Regulations Applicable to the Project

Noise Area Classification (NAC)	<u>Noise Standards</u>			
	<u>Day (0700-2200)</u>		<u>Night (2200-0700)</u>	
	<u>L₅₀</u>	<u>L₁₀</u>	<u>L₅₀</u>	<u>L₁₀</u>
1 (residential)	60	65	50	55
2 (commercial)	65	70	65	70
3 (industrial)	75	80	75	80

In addition, so-called "Draft 12" revisions to the current noise control rules (Chapter 7010) are being considered by MPCA. The following L_{eq} levels would (if adopted by MPCA) replace those L_{50} and L_{10} levels cited above.

(NAC)	<u>Noise Standards</u>	
	<u>Daytime</u>	<u>Nighttime</u>
	<u>L_{eq}</u>	<u>L_{eq}</u>
1	63	53
2	68	68
3	78	78

Source: MPCA, 1983.

4.3.2 Existing Noise Levels

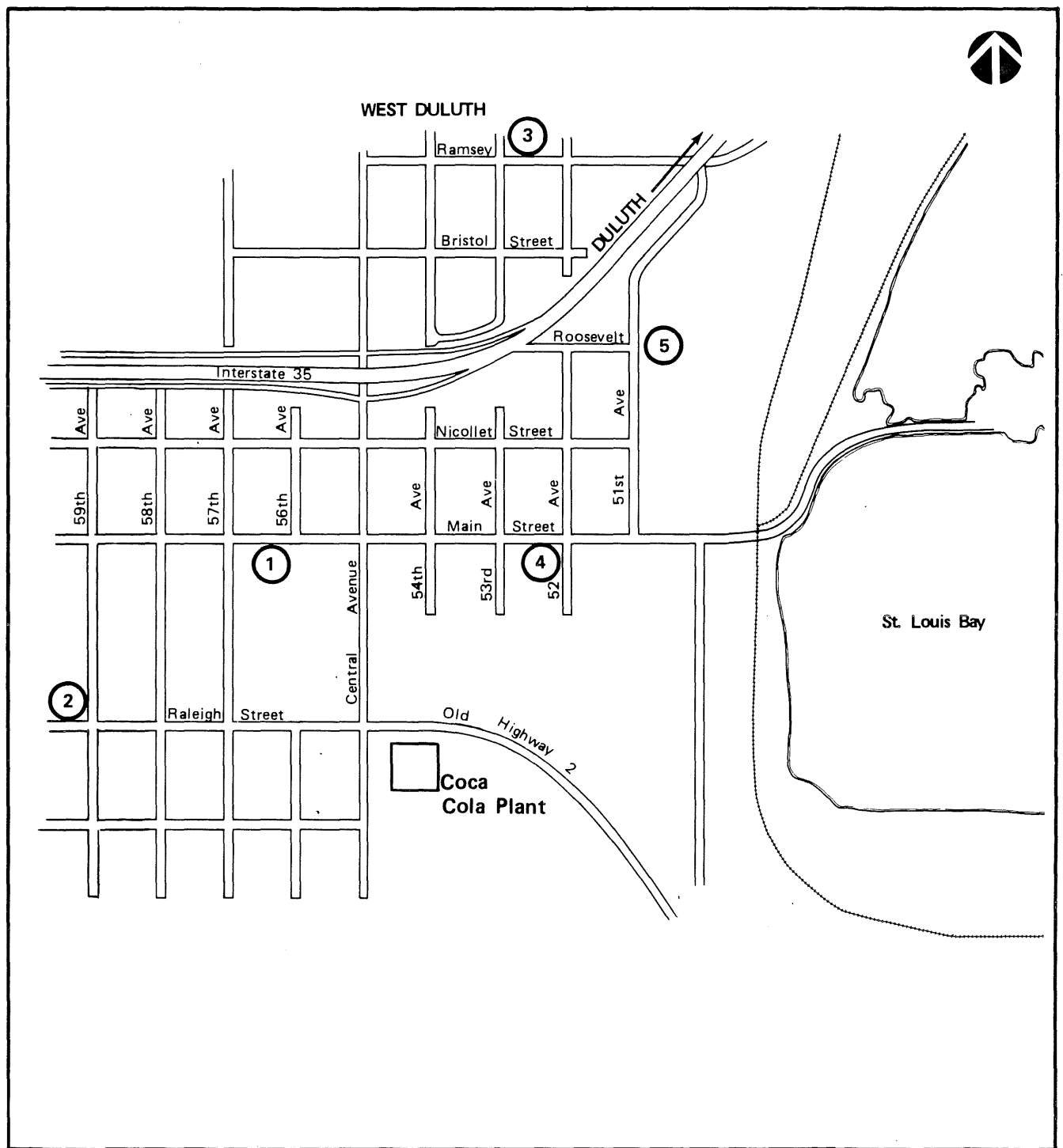
To obtain baseline noise levels, sound level measurements were made at three sensitive receptor locations in the vicinity of the project and at two locations onsite. A sensitive receptor is a location where the local population could be impacted by the noise generated by the proposed facility. For this study the Irving Playground (between Main and Raleigh Streets), the school at the Good Shepherd Catholic Church (Raleigh Street and 59th Avenue West), and the Ramsey Manor apartment building (at Ramsey Street and 53rd Avenue West) were identified as sensitive receptors (Figure 4.3-1). These receptors were chosen because of the sensitivity of the land uses and their proximity to the proposed facility. The playground is approximately 1100 feet west of the project buildings, while the school and the apartment building are approximately 1600 feet, respectively, from the operating portion of the mill.

Noise levels were measured during nighttime conditions on Tuesday, September 24, and during daytime on Wednesday, September 25, 1985, at periods of time corresponding to expected minimum and maximum noise producing activity, respectively. Both the maximum and minimum noise levels are important for assessing the impact of the proposed mill. The current maximum noise levels will limit the magnitude of any additional noise the project could add and still be in compliance with the MPCA standards. However, the current minimum noise levels will determine how noticeable any additional noise from the mill might be to the population. Table 4.3-2 is a list of the A-weighted noise levels measured for both daytime and nighttime periods during 15-minute measurement periods.

Noise level symbols used in this analysis are L_{90} , L_{50} , L_{10} and L_{eq} . L_{90} is the sound level exceeded 90 percent of the time and is used as a measure of background noise. L_{50} represents the median noise level. L_{10} is the sound level exceeded 10 percent of the time, while L_{eq} represents the equivalent of an average steady sound level.

The maximum daytime L_{90} (background) noise level measured on the Main Street side of the Irving Playground was 47 dBA. This is representative of typical urban residential locations (EPA, 1971). The primary sources of noise observed at this location were vehicular traffic on I-35 and Central Avenue, and an airplane passing overhead. Nighttime noise levels (L_{90}) recorded at this receptor were 40 dBA. Monitored L_{50} , L_{10} and L_{eq} daytime and nighttime noise levels at the playground (Table 4.3-2) were all within MPCA standards for NAC-1 (residential) receivers.

With respect to Good Shepard School, the maximum L_{90} daytime level was also 47 dBA. The major sources of noise observed at this location were traffic on Raleigh Street, people talking, and machinery operating on an adjacent street. The nighttime L_{90} noise level recorded at this receptor was 36 dBA. The monitored L_{50} daytime noise level at the school was within MPCA standards for NAC-1 receivers. The monitored L_{10} and L_{eq} daytime noise levels were at the allowable limit of MPCA standards, 65 and 63 dBA, respectively. Monitored nighttime L_{50} , L_{10} , and L_{eq} noise levels at the school were all within MPCA standards for NAC-1 receivers.



Legend



Noise Receptor Locations

- 1 Irving Playground
- 2 School at Good Shepherd Catholic Church
- 3 Ramsey Manor Apartment Building
- 4 Union Compressed Steel Company
- 5 Chun King/Jeno's Parking Lot

Source: ERT, 1985

0 100 300 500 Feet

Noise Measurement Site Locations

Figure 4.3-1

Table 4.3-2. Measured Community Noise Levels

Receptor	Time ^a /Date	L ₉₀	L ₅₀	L ₁₀	L _{eq}	Source of Noise ^b
Irving Playground	1405/9-25-85	47	51	59	56	I-35 traffic, local traffic, airplane
	2320/9-24-85	40	43	47	45	I-35 traffic, local traffic
Good Shepard School	1425/9-25-85	47	53	65	63	Local traffic, people talking, machinery
	2340/9-24-85	36	40	47	49	Local traffic
Ramsey Manor Apartments	1445/9-25-85	53	57	66	64	I-35 traffic, local traffic, car horn/door, airplane, child playing on street
	2300/9-24-85	44	48	53	51	I-35 traffic, local traffic, car horn/door
Union Compressed Steel Company	1325/9-25-85	45	50	61	62	I-35 traffic, local traffic, talking, birds
	2400/9-24-85	40	42	48	51	I-35 traffic, local traffic
Chun King Parking lot	1345/9-25-85	53	57	61	59	I-35 traffic, local traffic
	0020/9-24-85	45	50	56	53	I-35 traffic, local traffic

Source: ERT, 1985.

a. Measurements taken for 15 minutes.

b. Indicated noise sources are those noted by instrument operator as clearly distinct above background, at least part of the measurement time. See Figure 4.3-1 for locations of receptor stations.

At the Ramsey Manor apartments, the daytime L_{90} levels were 53 dBA. This level relates to noisy urban residential location (EPA, 1971). The major sources of noise observed at this receptor were I-35 and local traffic, an airplane passing overhead, car horn and car door closing, and a child playing on the street. The nighttime L_{90} noise level recorded at this location was 44 dBA. The monitored L_{50} daytime noise level at the apartment was within MPCA standards for NAC-1 receivers. The monitored daytime noise levels, however, exceed MPCA standard of 65 dBA for L_{10} and the proposed L_{eq} standard of 63 dBA, but only by 1 dBA. Monitored nighttime L_{50} , L_{10} and L_{eq} noise levels at the apartment were all within MPCA standards for NAC-1 receivers.

Observed L_{90} noise levels at the two measurement points on the project site (at the Chun King parking lot, and Main Street at the Union Compressed Steel Company facility), ranged from a low of 40 dBA at night to a high of 53 dBA during the day. Dominant sources of noise at these two locations were I-35 and local traffic. Nighttime noise levels for L_{90} , L_{50} , L_{10} and L_{eq} were considerably less than daytime observations at all measurement locations.

The data indicate that during daytime hours the playground and the school are exposed to typical noise levels associated with urban residential areas. The apartment building may be exposed to noise levels associated with noisy urban residential areas as measured against the EPA classification system (EPA, 1971) and some of the MPCA standards.

4.3 References

Environmental Research & Technology, Inc., 1985. Duluth Paper Mill-Noise, P-D864-500, prepared for PNTA-MPL, Concord, MA.

EPA, see U.S. Environmental Protection Agency.

ERT, see Environmental Research & Technology, Inc.

Minnesota Pollution Control Agency, 1983. "Noise Pollution Control Rules", Minnesota Rules, Chapter 7010.0400 and Draft 12, Section 7010.0140.

MPCA, See Minnesota Pollution Control Agency.

Smedburg, 1986. Telephone conversation between Smedburg, City of Duluth, and K. Eckerstrom, NUS, Corp., about city noise regulations, January 2.

U. S. Environmental Protection Agency, 1971, Community Noise, Document NT1D 300.3

4.4 LAND USE AND ZONING

This land use description includes an inventory of existing and planned land uses for the project site and the surrounding area. The zoning review focused on the permitted uses under existing zoning on the site based on the City of Duluth Zoning Regulations. Also included is a discussion of the Border City, Enterprise Zone System and the "Land Use and Management Plan for the Duluth Harbor."

4.4.1 Existing Land Uses

The project would be constructed in West Duluth on a 92-acre site bounded by Interstate 35 (I-35) to the north; Burlington Northern Railroad tracks, the Hibbard Station and Berwin Dock (where iron ore boats are docked) on St. Louis Bay to the east; a railroad marshalling yard, Coca Cola bottling plant, and Old Highway 2 to the south; and Central Avenue, Irving Playground and residential area to the west.

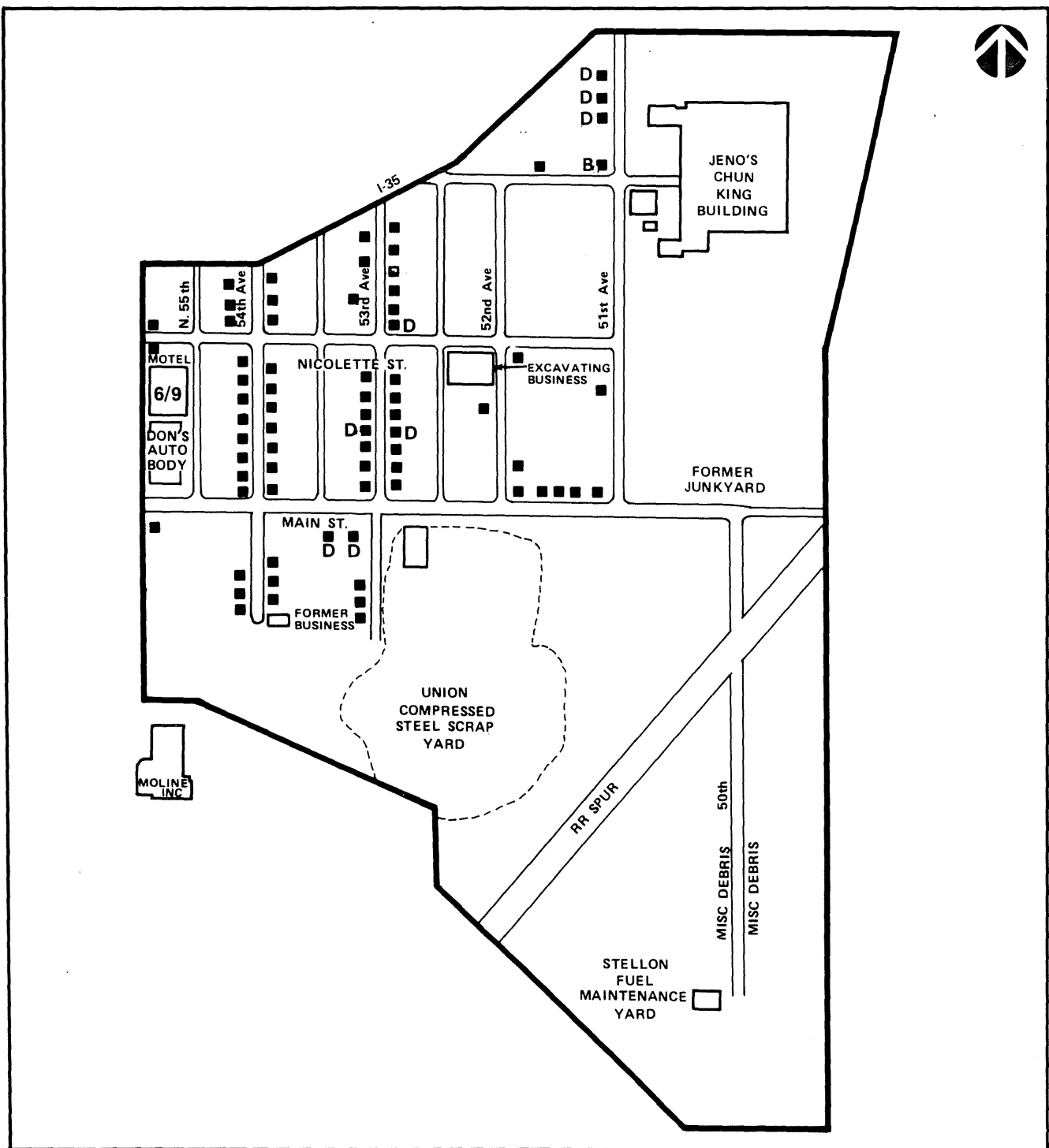
The site area is generally characterized by industrial development that includes the former Union Compressed Steel Company (metal scrapyard); International Transport, Inc. (truck storage and dispatch yard); the Harcourt, Brace and Jovanovich (HBJ) printing facility; Moline Company (food processing equipment manufacturer); a furniture refinishing operation; and the Hibbard Station.

Interstate 35, which connects the Twin Cities with Duluth, bounds the project site on the north and serves as a major access route to downtown. North of I-35 is a mixture of residential, retail, and commercial uses.

Immediately to the south and southwest of the project site and Old Highway 2 in the Grassy Point Industrial Area are the Coca Cola bottling plant, C. Reis Coal Company, Duluth Dock and Transport, and a railroad marshalling yard. East of the project site is St. Louis Bay, and a series of small islands used by gulls and terns for nesting. There are no designated parks or recreation areas at the project site, although the public is allowed and does fish from the existing Hibbard Station peninsula.

Potentially sensitive land uses in the area include the Irving playground which is located between Main and Raleigh Streets and is adjacent to the project site property across Central Avenue. The Irving school is 400 feet away from the property boundary, and is presently not in use. Further northwest, approximately 1000 feet away, is the Haven Evangelical Church on Nicollet and 58th Street. One additional institution, the Good Shepherd Catholic Church, is located 1500 feet west of the project's property boundaries.

The project site is presently privately owned. It is largely occupied by residential and commercial uses that include over 70 single family dwellings, 8 duplexes, 1 apartment building, a motel which rents out approximately 9 units as apartments, and several operating businesses as shown in Figure 4.4-1. The Jenou Chun King building at the northeast corner of the project site is unoccupied. A breakdown of the overall site land uses is given below.



Legend

- = Residential Structures 73
- D = Duplex - 8 Additional Residences
- B = Boarding / Apartment House - 2 Additional Residences
- Motel= 6 Rental Units / 9 Apartment Units

Total: 92 Residential Units
3 Active Businesses

0 200 400 Feet

Project Site Land Use Features

Figure 4.4-1

Brush/wetland	- 26 acres (28.3%)
Residential	- 26 acres (28.3%)
Vacant/abandoned	- 24 acres (26.1%)
Commercial	- 14 acres (15.2%)
Forest/wooded	- 2 acres (2.1%)
Total	<u>92 acres (100.0%)</u>

About 30 percent of the project site is occupied by open brush/grassland/wetland on the eastern portion of the site and is not in active use. As illustrated in Figure 4.4-1 the residential area is primarily in the north and west portions of the site located on Main, Nicollet and Roosevelt Streets, Central Avenue, 54th Avenue West, 53rd Avenue West and 52nd Avenue West. The site is also crossed by Burlington Northern Railroad tracks and two double circuit 115 kv transmission lines.

4.4.2 Zoning

The project site is currently zoned mostly as M-1 and M-2 manufacturing districts as shown in Figure 4.4-2. The northwest portion of the site is zoned R-2, residential, and the western edge is zoned C-2, commercial.

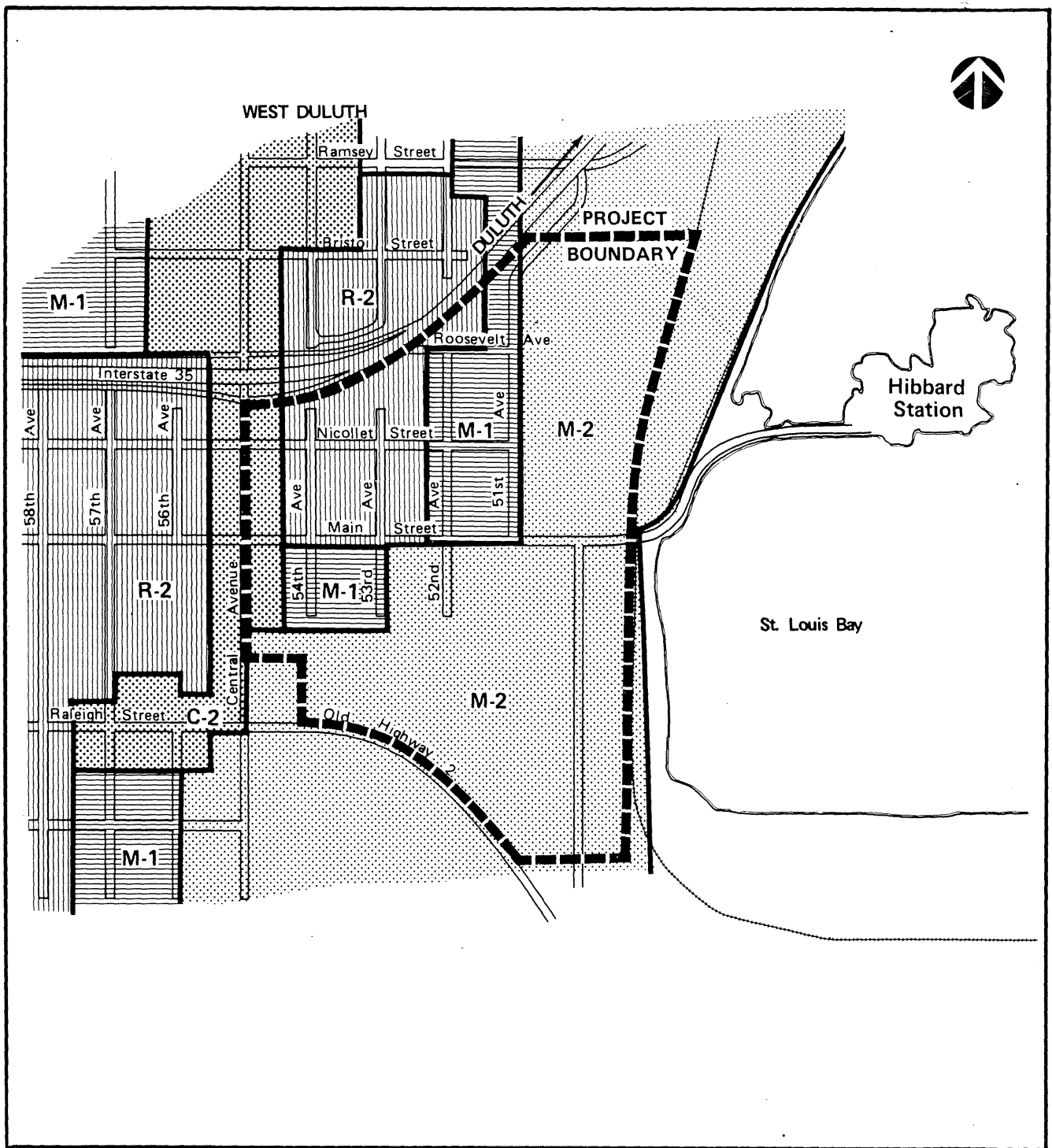
M-1 is the more restrictive of the two manufacturing zoning designations. Permitted uses in the M-1 district are generally wholesale and retail trade, service industries, and light industries that manufacture, process, store, and distribute goods and materials and which are, in general, dependent on raw materials refined elsewhere.

Uses permitted in the M-2 district include any use permitted in the M-1 district as well as additional heavy industries and uses not in conflict with any state statute or Duluth zoning code provisions regulating nuisances. In addition, there are a number of uses which are permitted when the location of such use has been approved by the city council after public hearing and investigation and report by the city planning commission. Paper manufacture is included among these uses.

The R-2 two-family residential district in the northwestern portion of the site is one of seven residential zoning classifications within the City of Duluth. Uses permitted in this district include any use permitted in the three one-family residential districts, as well as two-family and townhouse dwellings.

A narrow strip of land on both sides of Central Avenue which comprises the western edge of the site is zoned C-2, Highway Commercial District. A variety of primarily commercial land uses are permitted within this district. Beyond the C-2 district, approximately 200 feet west of the project's boundary, lands are zoned R-2. Similarly, lands to the northwest of the site are zoned R-2.

Lands south and east of the project site are zoned W-I, Waterfront District, which allows boat and ship related facilities, power generation plants, waterworks, and any specifically approved M-2 zone uses. To the northeast, lands are zoned M-2, M-1 and W-I.



Legend

-  **M-1** Manufacturing District
(General and Light Industry)
-  **M-2** Manufacturing District
(M-1 and Heavy Industry)
-  **R-2** Family Residential
-  **C-2** Commercial

0 100 300 500 Feet

Zoning Map

Figure 4.4-2

Source: ERT, 1985.

The southern and eastern portion of the project site is subject to flood-plain and Shoreland Management Regulations (Chapter 51, Water Resource Protection Ordinance) which are designed to control land uses and their resultant effects on these water related areas. Permits for uses in the floodway district must be secured under the terms of approval by the Minnesota Department of Natural Resources prior to being approved by the City.

4.4.3 Enterprise Zone and Land Use Planning

The Minnesota State Legislature enacted the Border City Enterprise Zone Program in 1983. That same year the Duluth City Council and the Minnesota Department of Energy and Economic Development (DEED) approved the designation of the project site as an Enterprise Zone. The program is designed to retain existing businesses, while also attracting new businesses through the use of tax incentives. The objective of the Duluth Border City Enterprise Zone is to increase the City's tax base, develop new employment opportunities, and improve conditions for business ventures. The project encompasses one of approximately 15 parcels of land identified as target areas within the Duluth Enterprise Zone (ERT, 1985).

The "Land Use and Management Plan for the Duluth - Superior Harbor" was prepared in July 1978 by the Metropolitan Interstate Committee (MIC) which is a joint venture of the Arrowhead Regional Development Commission, Northwest Wisconsin Regional Planning Commission, and urban area communities. Although the plan has not been adopted by the participating governmental entities, it is used as a resource document by the Duluth planning community.

According to the plan, the proposed land use for the eastern section of the project site is generally industrial. Marine industry is designated to the southeast. The plan indicates that the Hibbard Station is to continue its current use. A proposed conservation area in the southern portion of Grassy Point is identified in the plan, given that the area possesses a variety of habitats not found elsewhere in such concentrations in the harbor. The small islands southeast of the site are also identified as conservation areas. No recreation areas are identified by the plan within the vicinity of the project, although neighborhood access to the waterfront east of and through the project area is proposed.

4.4.4 Aesthetics

The 92-acre project site is a heterogeneous mix of visual elements which reflect the history of various uses of the area. The northwestern and western site areas are characterized as residential with well maintained houses and tree-lined streets. Much of the remainder of the site can be characterized as open land scarred by visible remnants of an industrial past.

The abandoned Jeno's Chun King building dominates the northeastern section of the site and is surrounded by open fields, as grasses and brush are beginning to reclaim the former parking lots and other adjacent areas. The open space character of the southeastern section of the site is disrupted by numerous trucks and fuel supply facilities at the Stellan Fuel Maintenance

Yard; and by the visual cacophony of the abandoned scrapyards with its piles of scrap metal, tires, and rusting equipment. Brush, grasslands and trees somewhat soften the harsh visual realities of the abandoned industrial lots in this zone.

4.4 REFERENCES

Environmental Research & Technology, Inc., 1985. Duluth Paper Mill - Land Use & Zoning, P-D864-600, Prepared for PNTA-MPL, Concord, MA.

ERT, see Environmental Research & Technology, Inc.

4.5 TRANSPORTATION

A field study of baseline transportation conditions was performed as part of the EIS preparation. The study was designed to gather data to describe current conditions and to facilitate subsequent analysis of the transportation impacts. The study and results of baseline data collection are described below.

4.5.1 Study Area Definition

The major intersections where papermill-generated traffic would be concentrated when either approaching or departing the project site were included in the study area. The proposer is planning to access the project site from Main Street and Old Highway 2 via Central Avenue (55th Avenue) and Interstate 35 (I-35). The traffic analysis, therefore, concentrated on the roadway operations on Central Avenue at Main and Nicollet Streets and at the I-35 on/off ramps. Data were also collected on Raleigh Street (Old Highway 2).

The field studies performed for the traffic engineering analysis included collection of roadway geometrics, traffic flow, traffic control, and safety data for key roadway facilities and intersection areas. The intersections analyzed were the following:

- o Central Avenue at I-35 Southbound on/off ramps
- o Central Avenue at I-35 Northbound on/off ramps
- o Central Avenue at Nicollet Street
- o Central Avenue at Main Street
- o Central Avenue at Raleigh Street (Old Highway 2)

Traffic recorder counts, data from the Minnesota Department of Transportation (MDOT), the Arrowhead Regional Development Commission, and field observations were all utilized in the study. Information pertaining to local rail operations was obtained from Burlington Northern Railroad.

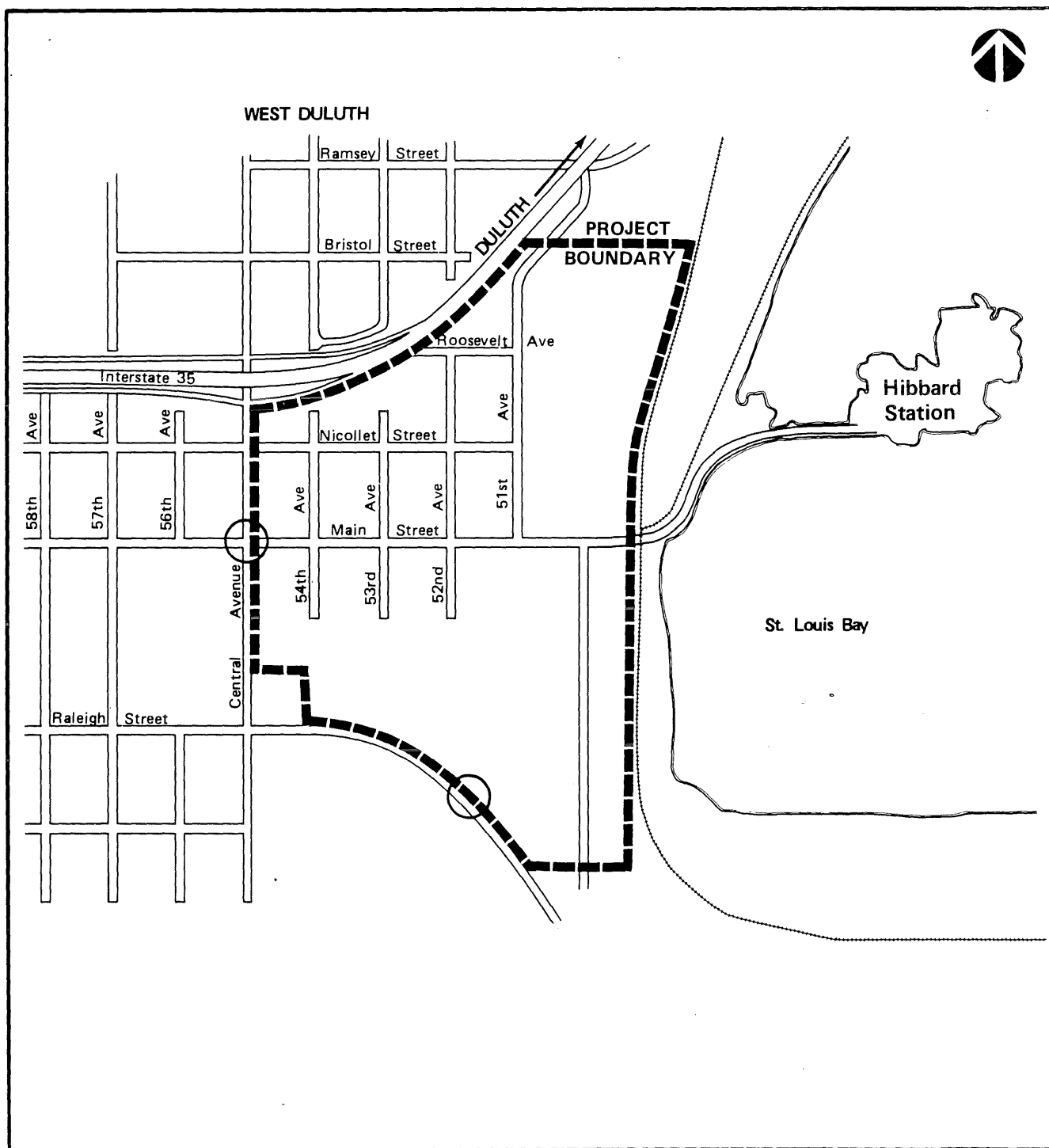
4.5.2 Vehicular Transportation Conditions

This section includes a description of roadway conditions, existing traffic, and intersection capacities in the study area. An analysis of existing traffic accidents is also presented.

4.5.2.1 Roadway Conditions

Employee access to the project site would be via Main Street east of Central Avenue south of the I-35 interchange, while truck deliveries would be made via Old Highway 2 (Figure 4.5-1). Main Street is an east to west, two-lane roadway approximately 50 feet wide that includes parking space on both sides of the roadway. The pavement in the area of the project site consists of bituminous concrete that is in good condition. West of Central Avenue, Main Street narrows to about 30 feet in width as an unimproved road with a mix of gravel/asphalt pavement that is in poor condition with many potholes.

Central Avenue (55th Avenue) is a north to south, two-lane roadway varying in width from 65 feet under I-35 to 40 feet south of Main Street to 30 feet



Legend



Site Access

Site Access Locations

Source: ERT, 1985

Figure 4.5-1

south of Raleigh Street. The pavement consists of bituminous asphalt that is in fair condition. The speed limit on Central Avenue is 30 miles per hour. Central Avenue is a designated truck route in Duluth.

Raleigh Street (Old Highway 2) is an east to west, two-lane roadway varying in width from 44 feet west of Central Avenue to 50 feet east of Central Avenue. The pavement consists of bituminous asphalt that is in good condition. There is a no parking restriction on the first block west of Central Avenue on the north side of the street between the hours of 2 P.M. and 6 P.M. The speed limit on Raleigh Street is 30 miles per hour. Raleigh Street is currently closed to through traffic east of Central Avenue and east of the C. Reis Coal Company.

Interstate 35 (I-35) is a four-lane limited access, median divided highway with a speed limit of 55 miles per hour. I-35 has a general north to south orientation that services Minneapolis/St. Paul to the south and central Duluth to the north. The pavement surface on I-35 consists of bituminous concrete and is in good condition. There is also a 10-foot wide break down lane in each direction of travel.

The interchange of I-35 with Central Avenue (Exit 252) is a diamond configuration. The intersections of the I-35 northbound and southbound on/off ramps with Central Avenue are stop sign controlled.

Nicollet Street is a two-lane east to west unimproved road approximately 20 feet in width. The roadway surface consists of gravel east of Central Avenue that is in poor condition. West of Central Avenue, the pavement consists of bituminous asphalt that is in good condition.

All of the gateway intersections to the immediate project site are stop sign controlled. Based on field inspection of the intersections of Central Avenue and the I-35 ramps, no deficiencies in roadway geometrics, traffic control, or safety conditions were identified on Nicollet, Main and Raleigh Streets on September 24 through 26, 1985.

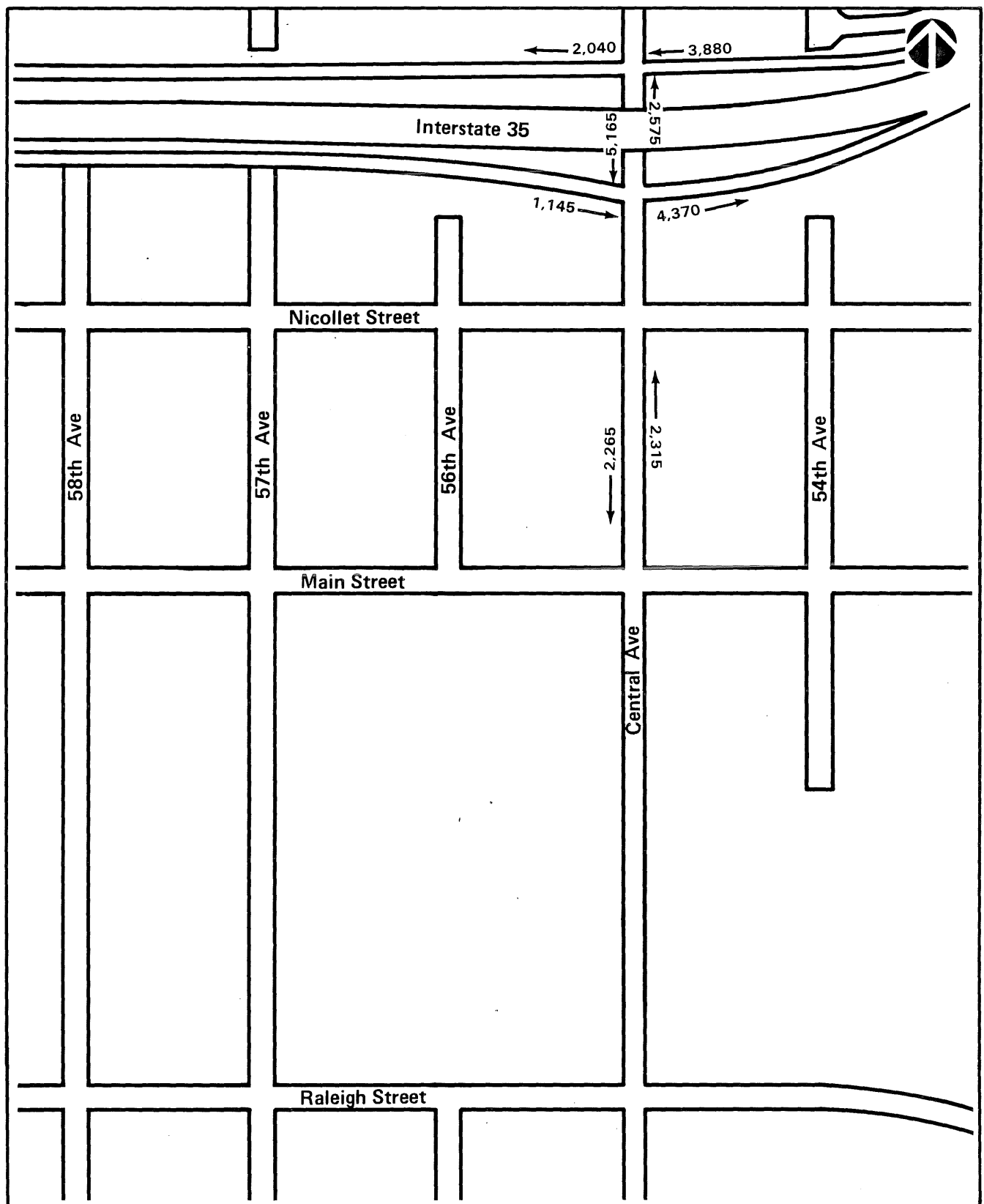
4.5.2.2 1985 Baseline Traffic Demand

The transportation study performed for the project indicated that Central Avenue, under I-35, has a two-way Average Daily Traffic (ADT) of 7740. Of this 24-hour total traffic demand, 2575 vehicles were northbound and 5165 vehicles were southbound. Between Main and Nicollet Streets, Central Avenue has a two-way ADT of 4580. Of this 24-hour total traffic demand, 2315 vehicles were northbound and 2265 vehicles southbound.

The ramp from Central Avenue to I-35 northbound has a one-way ADT of 4370, while the ramp from I-35 northbound to Central Avenue has a one-way ADT of 1145. These ADT values are illustrated on Figure 4.5-2. The A.M. peak hour was found to occur between 7:30 and 8:30 A.M. while the P.M. peak hour occurred from 3:30 and 4:30 P.M. Figures 4.5-3 and 4.5-4 summarize the A.M. and P.M. peak hour traffic patterns.

4.5.2.3 Existing Intersection Capacity

Capacity analyses were performed for the key intersection areas using the 1985 baseline A.M. and P.M. peak hour traffic demand. Measures of the

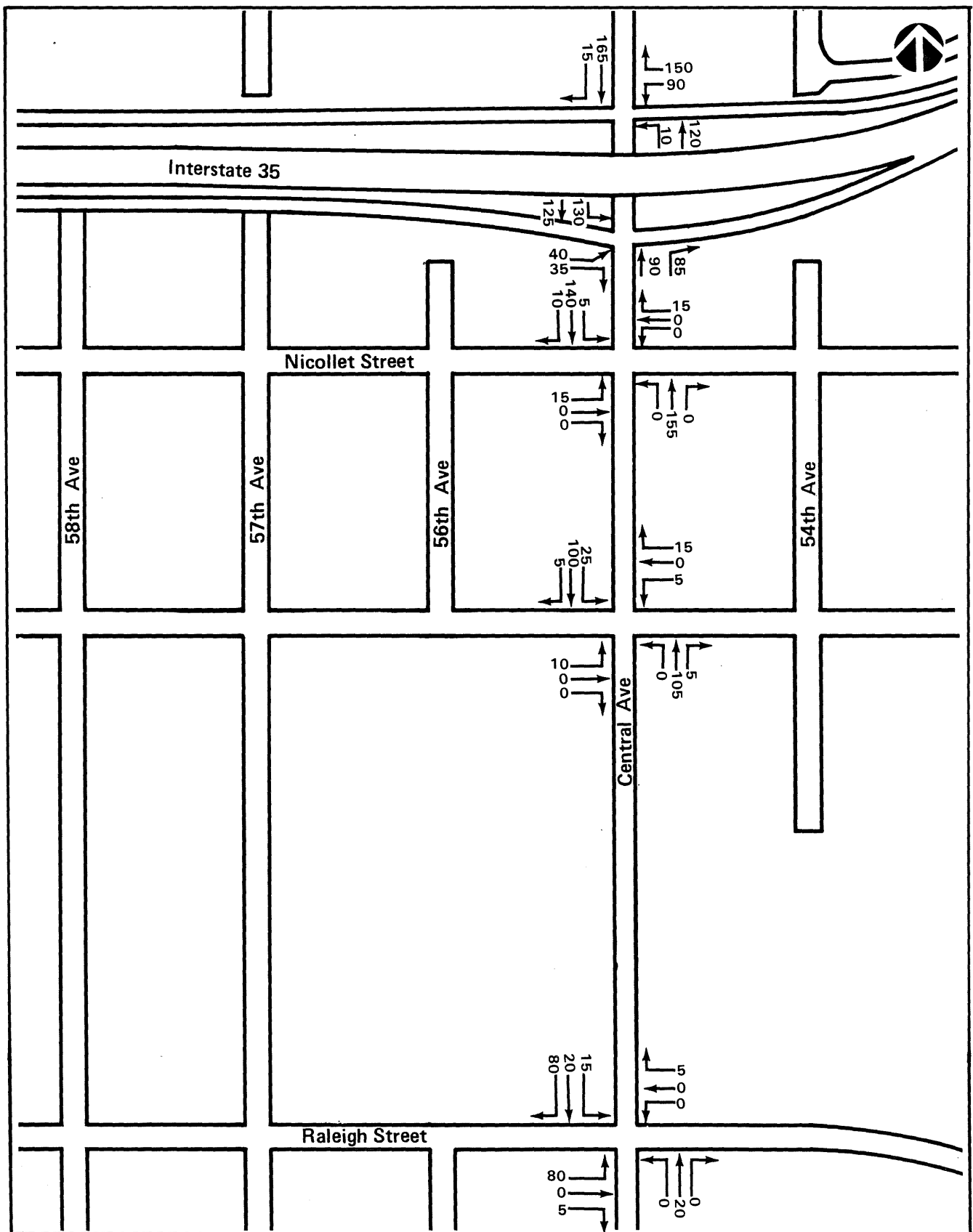


0 50 100 200 Feet

1985 Average Daily Traffic (ADT) Volumes

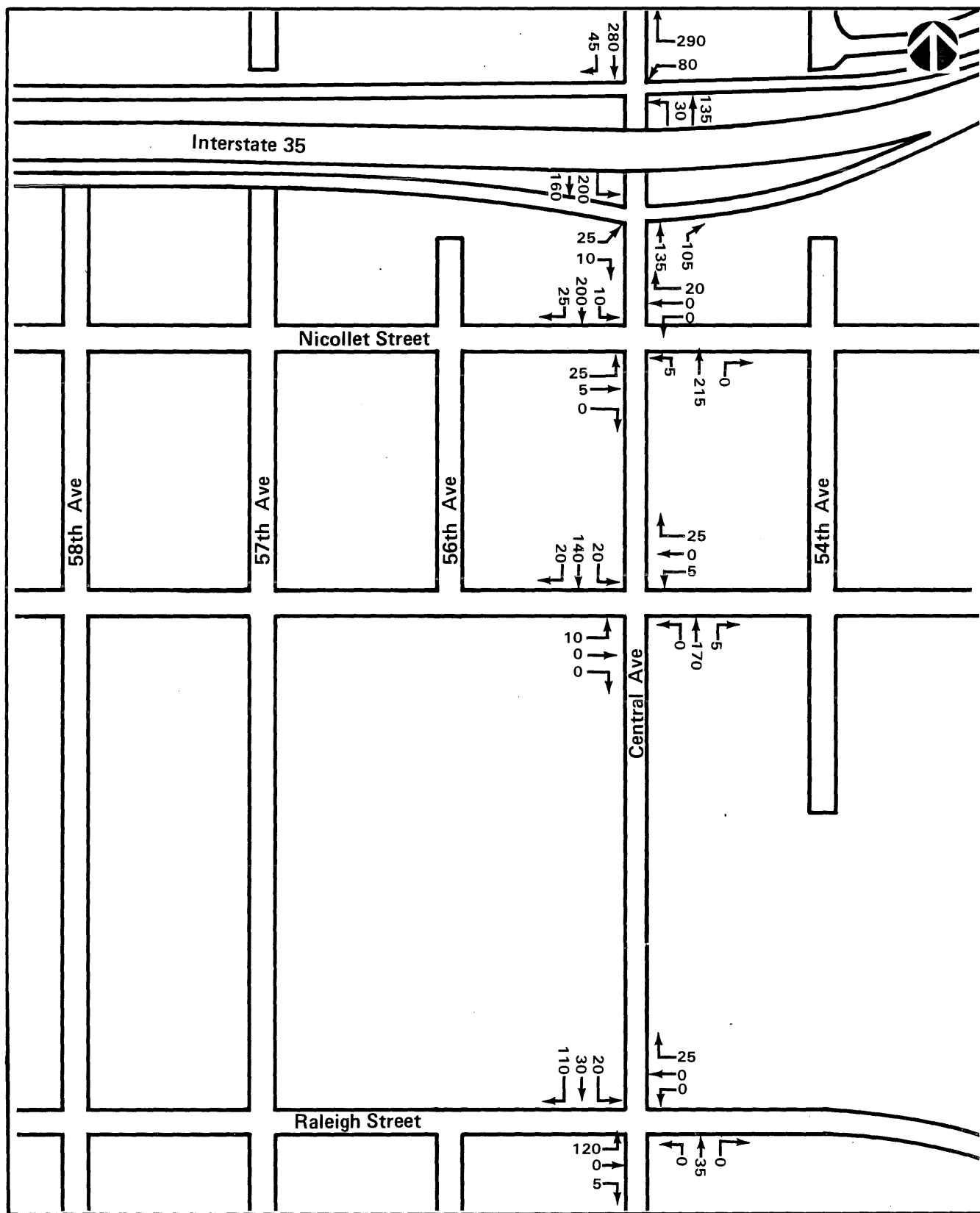
Source: ERT, 1985

Figure 4.5- 2



0 50 100 200 Feet

1985 A.M. Peak Hour Traffic Volumes (7:30-8:30 A.M.)



0 50 100 200 Feet

1985 P.M. Peak Hour Traffic Volumes (3:30-4:30 P.M.)

quality of traffic flow are expressed by letter designations called Levels of Service (LOS). Levels of Service range from Level "A" with stable free flow to Level "E" which is capacity at unstable flow or the maximum amount of traffic which can be accommodated at the intersection. Conditions worse than capacity are designated Level "F". At this level, flow is forced; and congestion and frequent delays result. All the key intersections analyzed in the study area are presently unsignalized. Table 4.5-1 describes the Level of Service relationships for both signalized and unsignalized intersections. A Level of Service "C", stable traffic flow conditions, is used as a desired operating standard.

Using procedures defined in the 1985 Highway Capacity Manual and the Transportation Research Board Circular 281, capacity analyses were performed for the intersection areas providing access to the site. The results of the analyses are summarized in Table 4.5-2. All of the key intersection areas are currently operating at a Level of Service "A" or "B", which are better than the Level of Service "C", stable flow operating standard.

4.5.2.4 Traffic Accident Analysis

The traffic accident analysis of the study area (along Central Avenue between the I-35 interchange and Raleigh Street/Old Highway 2) was based on data provided by the City of Duluth Police Department for the years 1984 and 1985 (January through September). The accidents were classified as either personal injury or property damage. During the 21-month period, a total of five accidents occurred at the Central Avenue intersections with the I-35 interchange, Nicollet, Main, and Raleigh Streets. Of the accidents reported at the I-35 interchange, two resulted in property damage and two in personal injury; two involved collision of two cars while one accident involved a car striking the central island. All five accidents occurred during mid-week (four on Wednesday and one on Tuesday). Two of the accidents occurred during the morning (one during the peak commuting hour); two at mid-day; and one during the afternoon peak commuter period.

None of the accidents reported at the intersections along Central Avenue involved fatalities. Based upon review of the "Manual on Uniform Traffic Control Devices," none of the intersections analyzed herein satisfy the warrant for geometric and/or traffic control upgrade due to accident experience criteria (five or more accidents of similar characteristics over a 12-month period).

4.5.3 Railroad Facilities

The Burlington Northern Railroad right-of-way and track traverse the southern portion of the project site in a northeasterly/southwesterly direction. From this track, three spurs will be extended north into the paper-mill. Current rail operations consist of four switches per day (ten cars per switch) during weekdays carrying primarily coal (70 tons/car), clay (80 to 100 tons/car), and lumber (70 tons/car). Southeast of the project site is a railroad freight yard with a 275 car capacity. Track and roadbed condition is fair and the type of control is yard limit, based on the adjacent freight yard (Burlington Northern Railroad, 1985).

Table 4.5-1. Intersection Level of Service Descriptions for
Signalized and Unsignalized Intersections

Level of Service	Volume/Capacity (V/C) Ratio/Reserve Capacity	Operating Characteristics
Signalized Intersections:		
A	0.000-0.60	Little or no delay. Excellent operation.
B	0.61-0.70	Short traffic delays. No waiting through signal cycles. Very good operation.
C ^a	0.71-0.80	Average traffic delays. No waiting through signal cycles. Good operation.
D	0.81-0.90	Long traffic delays. Occasional waiting through more than one cycle. Fair operation.
E	0.91-1.00	Very long traffic delays. Delays up to several signal cycles. Poor operation.
F	1.00-Varies	Jammed conditions. Backups may block other intersections. Forced flow.
Unsignalized Intersections:		
A	400-Varies	Little or no delay.
B	300-399	Short traffic delays.
C ^a	200-299	Average traffic delays.
D	100-199	Long traffic delays.
E	0-99	Very long traffic delays.
F	Varies-0	Failure - extreme congestion.

Source: Transportation Research Board, 1980.
Transportation Research Board, 1984.

- a. LOS "C" is the accepted operating condition for both signalized and unsignalized intersections.

Table 4.5-2. 1985 Existing Levels of Service

Intersection	Level of Service	
	A.M.	P.M.
Central Avenue at I-35 southbound on/off ramps	A	B
Central Avenue at I-35 northbound on/off ramps	A	B
Central Avenue at Nicollet Street	A	A
Central Avenue at Main Street	A	A
Central Avenue at Raleigh Street	A	A

Source: ERT, 1985.

4.5 References

- Arrowhead Regional Development Commission, _____.
- Burlington Northern Railroad, St. Paul Office, Al Nelson, Line Utilization and Capacity Data, October and November 1985.
- City of Duluth Police Department, Lt. James Otto, 1984 and 1985 Traffic Accident Data, October 1985.
- Environmental Research & Technology, Inc., 1985. Duluth Paper Mill - Transportation, P-D 864-400, prepared for PNTA-MPL, Concord, MA.
- ERT, see Environmental Research & Technology, Inc.
- Minnesota Department of Transportation, David Bonnin (Duluth Travel Forecaster), Travel Forecast and Traffic Count Data, August and September 1985.
- _____, Betty Holsemer, vehicular miles travelled and accident data for Interstate 35 in West Duluth, November 1985.
- Transportation Research Board, 1984. Proposed Chapter for the 1985 Highway Capacity Manual, Circular Number 281, MN Dept. of Trans., June.
- Transportation Research Board, 1985. Highway Capacity Manual, Special Report 209, National Research Council, Washington, D.C.
- _____, Circular Number 212, January 1980.
- U.S. Department of Transportation, Federal Highway Administration, Manual on Uniform Traffic Control Devices, 1983.

4.6 GEOLOGY, SOILS, AND GROUNDWATER

The geology, soils, and groundwater conditions in the project area have been reviewed on a regional as well as site-specific basis because environmental processes are not limited by the boundaries of land ownership. Analytical laboratory data from site soil and groundwater samples have been regarded as particularly important for this site for developing baseline conditions because of the historical land uses. Available data suggest that unregulated waste management practices have been prevalent on portions of the project site.

4.6.1 Regional Geology

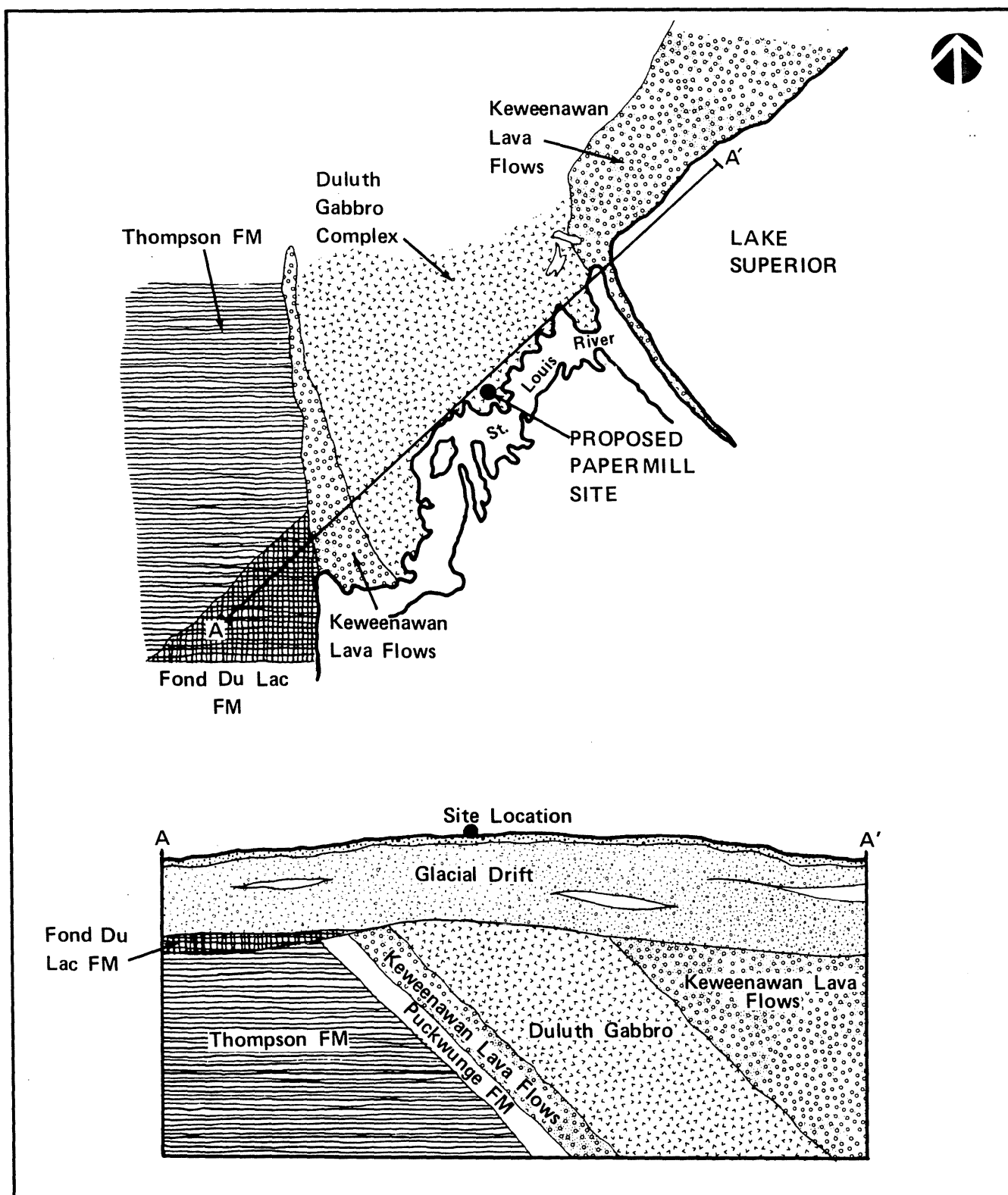
The site of the mill is in the Superior Upland Structural Province of the Canadian Shield (Hunt, 1974). Bedrock in the area is Precambrian in age. The oldest rocks are the slate and graywacke beds of the Thompson Formation. These beds were intensely folded, eroded, and unconformably overlain by Puckwunge conglomerates and sandstones. Subsequently, a long period of volcanic activity resulted in a thick sequence of basalt and rhyolite flows. The Duluth Gabbro intruded the rocks concordantly near the base of the volcanic sequence. Following the cessation of volcanic activity, an asymmetrical depression called the Lake Superior Syncline was formed. Thick deposits of sedimentary rocks, such as the Fond du Lac sandstones and shales, were deposited in this synclinal basin (Schwartz, 1949). There is no rock record of geologic events which occurred during the approximately 570 million years from Precambrian time to the Pleistocene Epoch. This is probably due to both nondeposition and erosion. Figure 4.6-1 is a bedrock geologic map and geologic cross section of the Duluth area.

Pleistocene glaciation had a profound effect on the land surface in the Duluth area. The Superior synclinal basin, which is presently partly occupied by Lake Superior, channeled a lobe of ice from the Laurentide Ice Sheet southwestward into the area. The Superior lobe scoured the Precambrian surface and deposited a layer of glacial drift. Glacial Lake Duluth, formed of ponded meltwaters at the front edge of the ice lobe, deposited glaciolacustrine sediments in the area during the late glacial and post-glacial periods (Moss et al., 1979).

Today, steep bluffs border much of the north shore of Lake Superior and the St. Louis River in the Duluth area. A relatively flat and gently sloping surface extends from the bluffs to the lake and river shores. The area is drained by the St. Louis River and by numerous small streams which discharge to Lake Superior (USGS, 1983a,b).

4.6.2 Site Geology

The ground surface on the site is relatively level, but slopes gently to the south and east toward the St. Louis River and Keene Creek. Local irregularities in the site topography exist due to cut and fill, and waste disposal activities. Surface elevations at the site range from 603 to 628 feet above mean sea level. Approximately one quarter of the site lies in the 100-year floodplain. Floodplain maps are included in Water Quality Section 4.2 (Figures 4.2-2 and 4.2-3).



Not to Scale

Bedrock Geologic Map and Geologic Cross Section of the Duluth Area

Sources: Minnesota Geological Society, 1981; Sandberg, 1938.

Figure 4.6-1

The underlying geology of the site consists of bedrock and the unconsolidated deposits above the bedrock. These unconsolidated deposits, particularly the soils, are of primary importance to site conditions. More than 100 feet of surficial deposits overlie the Duluth Garbo bedrock beneath the site. Near surface soils are of three types, as designated by the U.S. Department of Agriculture, Soil Conservation Service (Figure 4.6-2). Ontonagon series soils (303) are mapped over much of the northern half of the site. A small area of Baseman series soil (531) is present in the northeastern portion of the site. The balance of the site surface, in the southern half and beneath the existing power plant, is designated "made land" (Boe, 1985).

The Ontonagon silty clay loam consists of well drained soils formed on glacial lake plains. This reddish-brown fine-grained soil has slow (low) permeability and moderate available water capacity. Shrinking and swelling of the soil can occur with changes in moisture content.

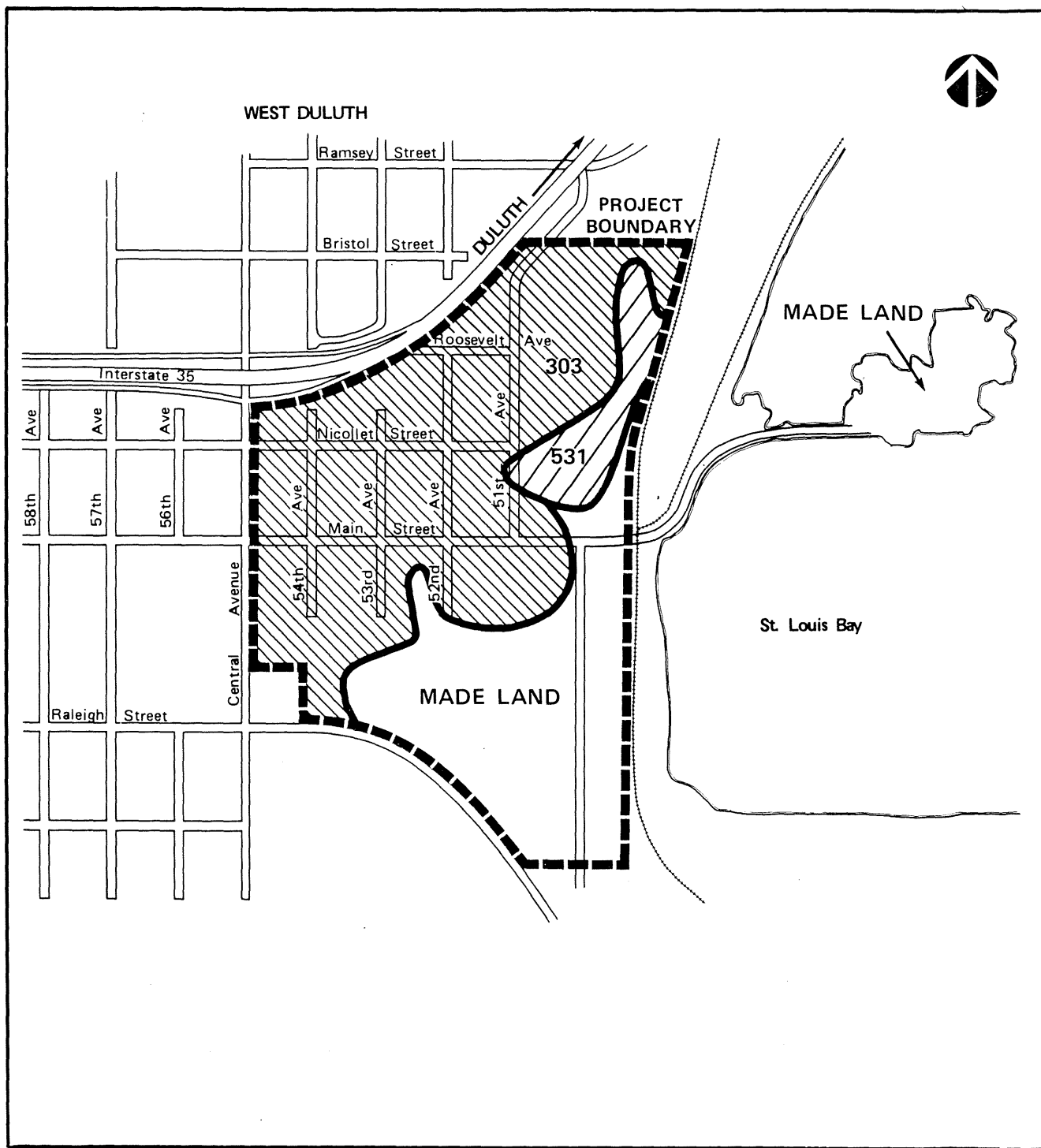
The Baseman series is a poorly-drained organic soil, and typically occupies drainageways, small depressions, and the outer margins of bogs within glacial moraines. The soil is reddish brown to gray in color. Permeability is moderately slow to moderately rapid. The available water capacity is very high. Surface runoff is ponded to very slow.

The "made land" consists primarily of well and moderately well drained soil material that has been removed from its natural location, transported, and deposited by earth-moving machinery. It typically is stratified, but lacks genetic horizons. The soil material is typically pale brown to reddish-brown loamy, sandy, or mixed loamy and sandy materials. Permeability and available water capacity vary according to the type of soil material used.

A total of 35 soil borings and monitor wells were drilled in 1984 and 1985 by STS Consultants, Ltd., and provide more detailed information concerning the soil profile in the project site area. The boring locations are plotted on Figure 4.6-3. The soils encountered during the boring program can be divided into three primary groups. A surface layer of miscellaneous fill is present and ranges in thickness from 2 to 17 feet. Silty sand and silt soils underlie the fill throughout most of the site area. The average thickness of the soil type is 15 feet, although it ranges from 0 to 35.6 feet. A silty clay was encountered throughout the site area beneath the granular soils. This soil material extends to at least 100 feet below grade, which is the depth penetrated by the deepest boring on the site.

The fill is variable in composition, comprised of clayey silts, silty clays, silty sands, and sandy gravels. Some wood, metal, concrete, and glass debris is present. One-half to 4 feet of peat are present at the base of the fill soils in some borings. Boring #8 encountered a 4.5 foot thick layer of sawdust at the base of the fill layer. The silty sand and silt soils are typically reddish-brown in color. Standard penetration test data indicate that these soils are medium dense to dense.

The silty clay soils encountered on the site are typical of soils found along the waterfront in the Duluth area. This reddish-brown, plastic, relatively impervious clay soil, was deposited in Glacial Lake Duluth during the



Legend

-  303 Ontonagon Series
-  531 Beseman Series

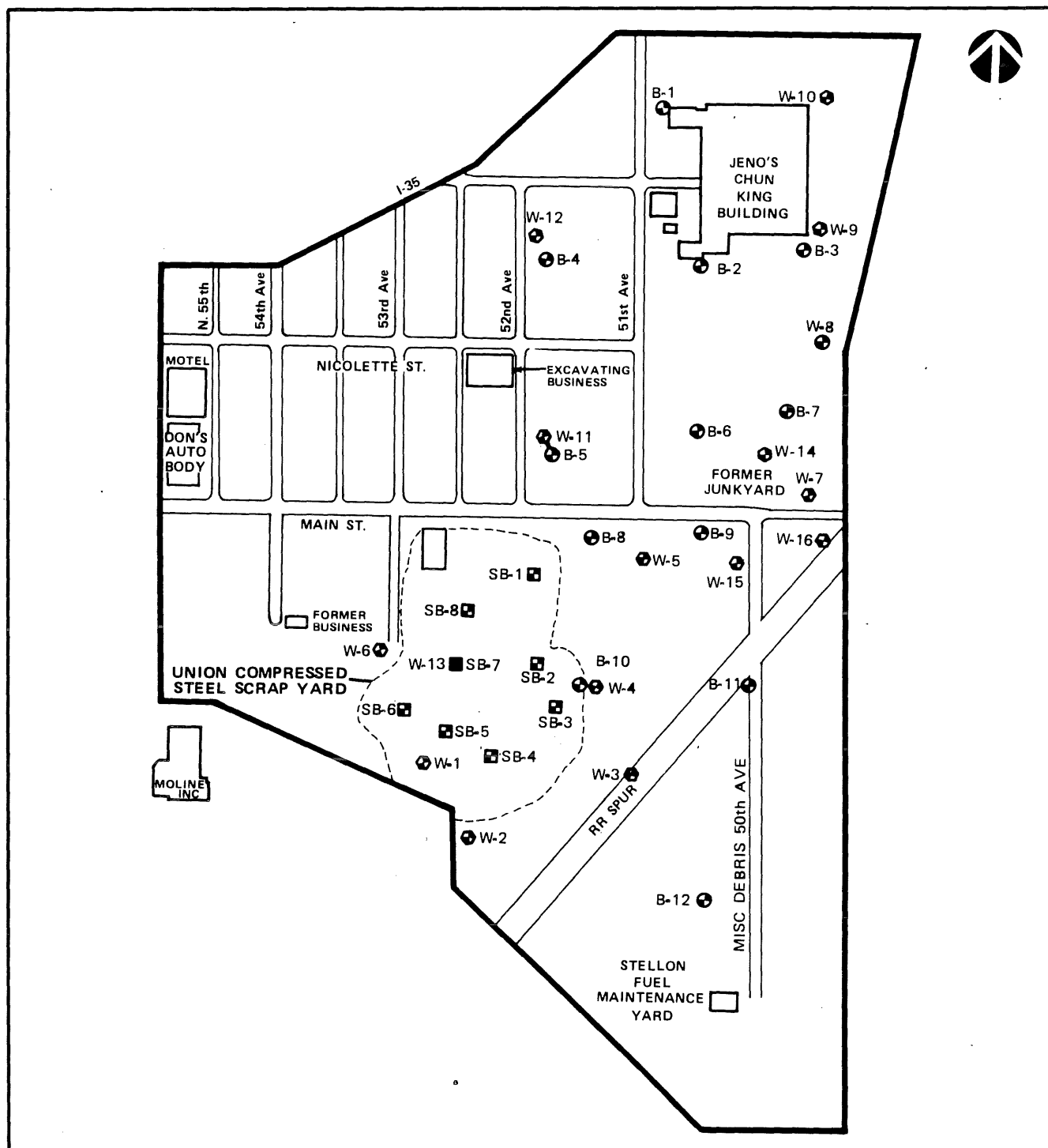
0 100 300 500 Feet



Soils Map, Project Site

Source: Boe, 1985.

Figure 4.6-2



Legend

- Soil Boring
- ⊕ Monitoring Well
- ⊙ Boring

0 200 400 Feet

**Site Map Showing Locations
of Soil Borings and
Monitoring Wells**

Pleistocene age. The base of the clay layer was not encountered by borings on the site. The low shear strength and high compressibility of clay can create difficult foundation problems (STS Consultants Ltd., 1984).

4.6.3 Groundwater

The distribution of aquifers in the Duluth area is a function of the thickness and character of the unconsolidated deposits and the bedrock. The thickness of the glacial drift varies from zero to hundreds of feet. Coarse granular glacial deposits, which yield abundant quantities of water, inter-finger with relatively impermeable silty and clayey deposits. The bedrock in the Duluth area is mainly of igneous and metamorphic origin, and is low in porosity and permeability except where fractured. Consequently, these rocks are not considered a significant source of groundwater in the Duluth area. The Keweenaw volcanic deposits have some porous zones at the tops of the individual flows; however the quality of the water obtained from these aquifers is not always acceptable. Aquifers exist in some of the sedimentary rocks in the area, such as the Thompson and Fond du Lac formations (Kanivetsky, 1978).

Groundwater elevations on the site range from 601.1 to 613 feet above mean sea level. Depths range from a few inches to 10 feet below grade. The general groundwater flow direction is to the southeast. Variations in the elevation of a relatively impervious clay layer on the site should be expected to cause local variation in flow direction (STS Consultants, Ltd., 1985).

It should be noted that groundwater wells are used for drinking water in the region, but that the project area and City of Duluth are served by a public water system supplied from Lake Superior.

4.6.4 Soil and Groundwater Investigations

Based on field observations and historical land use data with respect to possible groundwater contamination on the site, an exploratory boring program was designed and executed by STS Consultants, Ltd. (1985). Sixteen monitoring wells were installed in the project site area to evaluate groundwater quality and hydrogeology as shown in Figure 4.6-3. In addition, eight borings (designated SB-1 through SB-8 on the site map) were drilled within the Union Compressed Steel scrapyard to obtain soil samples for chemical analysis; as this was potentially the most contaminated area of the entire site.

At each soil boring and monitoring well location, representative samples of the subsurface soils were collected using the standard split-barrel sampling procedure. Soil samples from borings SB-1 through SB-8 were taken to the Minnesota Power chemistry laboratory for analysis. PCB analyses were performed by Serco in Roseville, Minnesota. Groundwater samples from wells 7, 14, 15, and 16 were split for analyses at the Minnesota Department of Health Laboratory and PACE Laboratories, Inc.

4.6.4.1 Soil Sample Analyses and Results

Soil samples from the borings on the Union Compressed Steel site (SB-1 through SB-8) were analyzed for polychlorinated byphenyls (PCBs), EPA extraction procedure (EP) toxicity, and oil and grease.

A total of ten soil samples from borings SB-1, 2, 3, 4, and 7 were analyzed for PCBs. Only PCB 1242 and 1260 were present above the instruments lower detection limit. PCB 1242 concentrations ranged from 0.080 to 8.0 mg/kg (ppm), and PCB 1260 concentrations ranged from 0.18 mg/kg to 6.9 mg/kg. Only one of the soil samples analyzed from the Union Compressed Steel site had total PCB levels greater than 10 ppm. Soil boring SB-3 had a total PCB concentration of 14.9 mg/kg (ppm) at a depth of 9.5 to 11.5 feet.

The EP-Toxicity test was performed on soil samples from the eight borings drilled on the Union Compressed Steel site. The contaminant concentrations are below RCRA maximum concentration limits, except for lead. Lead concentrations ranged from 0.05 ppm to 55.2 ppm (EP toxicity). The RCRA maximum concentration limit for lead is 5 ppm. Lead at concentrations above the limit was measured in the leachate of samples from borings SB-1, 2, 3, 5 and 7. The highest lead concentration, 55.2 ppm was obtained from samples taken at a depth of .5 to 2.5 feet boring SB-5 (ERT, 1985). In all but one boring, these high concentrations were obtained from fill material. Boring SB-7 had a high concentration of lead in granular soils which underlie the fill soils.

Oil and grease concentration in the soil samples ranged from 21 to 18,500 mg/kg (ppm). The highest oil and grease concentrations were measured in borings SB-3 and 4.

4.6.4.2 Water Sample Analyses and Results

Samples from monitoring wells W-1 through W-13 were analyzed for 53 volatile organic compounds in September of 1985 (ERT, 1985). Samples from wells W-7, W-14, W-15, and W-16 were analyzed for 54 volatile organic compounds in November of 1985 (MDHEL, 1985). Groundwater from monitoring well W-7 exhibited anomalously high concentrations of benzene, dichlorobenzene, dichloroethylene, trichloroethylene, and vinyl chloride. Wells W-14, 15, and 16 also contained elevated levels of volatile organics. These wells were located in an old junkyard at the end of Main Street between 51st Avenue and a railroad right-of-way. This area consists of partially buried debris, rubble, tires, auto parts, concrete debris, crushed drums, motor oil cans, and paint cans. Table 4.6-1 shows the concentration levels of key volatile organic compounds in selected wells. The analysis of the water samples for priority pollutant metals did not reveal elevated concentrations.

Table 4.6-1. Concentration Levels of Key Volatile
Organic Compounds in Selected Wells
(micrograms/liter)

Contaminant	Well Number									
	3a	7a	7b	8a	9a	10a	13a	14b	15b	16b
Acetone	--	15	--	--	--	--	--	7,700	180	--
Benzene	--	350	2,000	--	--	--	--	130	25	--
1,4 Dichlorobenzene	--	440	--	--	--	--	--	--	--	--
1,1 Dichloroethylene	--	61	--	--	--	--	--	--	--	--
1,2 Dichloroethylene, Cis	<0.9	<56,000	53,000	<0.3	<1.4	<3.4	<1.4	66	--	--
1,2 Dichloroethylene, Trans	<0.9	<56,000	--	<0.3	<1.4	<3.4	<1.4	--	--	--
Trichloroethylene	2.8	57,000	--	3.3	10	20	5.8	--	--	--
1, 1, 2 Trichloroethylene	--	--	30,000	--	--	--	--	94	--	6.2
Vinyl Chloride	--	2,000	--	--	--	--	--	--	--	--

a. ERT, 1985

b. MDHEL, 1985

<: Less than or equal to; compounds co-elute.

4.6 References

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4.7 SOLID AND HAZARDOUS WASTES

Existing conditions regarding solid and hazardous wastes in the project area are discussed in this section. Regulatory requirements are identified, potential hazardous wastes from previous operations are described, and the current waste generation and disposal practices in the study area are defined.

4.7.1 Regulatory Considerations

All solid waste facilities in the State of Minnesota are governed by either Minnesota Rules, Chapter 7035 - Solid Waste Rules or Minnesota Rules, Chapter 7045 - Hazardous Waste. Chapter 7035 regulates facilities that handle solid wastes generated by residential, commercial, institutional, and industrial sources that have nonhazardous characteristics. Permits are required for all handling (e.g., transfer stations), processing (e.g., incinerators), and disposal facilities (e.g., sanitary landfills).

A more complex and comprehensive set of regulations, under Chapter 7045, are invoked for solid wastes that fall into the hazardous category. A waste is classified as hazardous if it is listed by the Minnesota Pollution Control Agency (MPCA) or exhibits the characteristic of ignitability, corrosivity, reactivity, toxicity, extraction procedures (EP) toxicity, or is an oxidizer (Minnesota Rules Parts 7045.0129 and .0131). Facilities that generate, transport, store, treat, or dispose of such wastes must report their activities to the MPCA and maintain proper records of operation. All wastes transported off the generator's site must be accompanied by a waste manifest to facilitate tracking of the waste to its ultimate destination. Treatment, storage, and disposal facilities must obtain Part B permits for their operations.

Industrial waste must be evaluated to determine the proper waste classification and hence, the most appropriate disposal method. Hazardous industrial waste must be disposed in a hazardous waste-approved site. Nonhazardous industrial waste can be disposed in a sanitary landfill if it passes the leach test. Failure of the leach test would require the nonhazardous industrial waste to be disposed in an industrial waste landfill. The leach tests employed for this evaluation are the Environmental Protection Agency's EP Toxicity test or the American Society of Testing and Materials (ASTM) Method for Leaching of Waste Materials Water Extraction Procedure. The EP toxicity test is used to determine the suitability of codisposal of industrial waste with municipal solid waste, and the ASTM Water Extraction Procedure is used for evaluating disposal at a segregated cell. Table 4.7-1 shows the maximum concentrations allowable for wastes evaluated by the leach tests.

In order to obtain a permit to dispose of nonhazardous industrial waste, the generator and the designated landfill permittee must submit a "Request for Codisposal of Nonhazardous Industrial Waste" to the Director of the MPCA specifying the characteristics of the waste and the proposed disposal method (i.e., codisposal, separate disposal, or land application). Upon approval by MPCA, the landfill may dispose of the quantity and form of waste approved subject to any special conditions imposed by the Director.

Table 4.7-1. Minnesota Pollution Control Agency:
Suggested Maximum Levels of Leachate^a
(Nonhazardous Industrial Waste)

Leachate Indicator	Allowable Leachate Concentration (mg/L)
Arsenic (As)	0.1
Barium (Ba)	10.0
Boron (B)	7.5
Cadmium (Cd)	0.1
Chlorides (Cl)	2500
Chromium (Cr ⁺⁶)	0.5
COD	10000
Copper (Cu)	10.0
Cyanides (CN ⁻)	0.1
Fluoride (F)	15.0
Iron (Fe)	3.0 (or 250 mg/L if only parameter exceeding standards)
Lead (Pb)	0.5
Manganese (Mn)	0.5 (or 25 mg/L if only parameter exceeding standards)
Mercury (Hg)	0.02
Nickel (Ni)	1.0
Nitrates (NO ₃)	450 (or 10 mg/L as N)
Oil and grease	25.0 (material must be landspread if exceeding 25 mg/L)
PCB	0.01
Phenol (C ₆ H ₅ OH)	0.01 (if chlorinated) 2.0 (if not chlorinated)
Selenium (Se)	0.1
Silver (Ag)	0.5
Sulfates (SO ₄)	2500
Total dissolved solids (TDS)	5000
Zinc (Zn)	50

- a. This program is designed primarily to determine the acceptability of codisposal of inorganic wastes. Codisposal of organic wastes will be determined on a case-by-case basis because of the complexity of these wastes.

4.7.2 Potential Hazardous Waste Sources

Historically, the project site contained a mixture of residential, commercial, and industrial uses. Examination of historical aerial photographs of the site revealed a number of scrapyards that operated on the site over the last 50 years (ERT, 1985). Substantial quantities of waste materials were buried or exposed on the site. Because of the nature of previous and existing industrial and commercial operations, it is expected that a portion of these wastes may contain hazardous constituents. It is important that these hazardous materials be identified before site improvements are initiated so that removal procedures can be developed to protect the residents, workers, and the environment. The following discussion identifies some of the current and past operations on the project site that have the potential to contain hazardous materials.

4.7.2.1 Union Compressed Steel and Scrapyard

The steel scrapyard is located in the center of the southern half of the project site. A substantial amount of filling of wetland areas has occurred on this property, including the dumping of construction debris and other scrap materials. The site was in operation since at least 1939 (ERT, 1985). Cars and appliances were disposed and metals were recovered on this property. Some metals were melted down and the slag was buried.

The project site contains large piles of debris and metal scrap, including appliances, automobile bodies, engine parts, tanks, drums, cans, and shredded metals. The drums and tanks are mostly empty and it does not appear that waste liquids (i.e., oils & solvents) were accepted at the site in large quantities. Oil contaminated soil is evident throughout the site, probably from oil drained from automobile engines.

Electric transformers were scrapped and burned on this property, and batteries were taken apart and the lead recovered. Large piles of discarded batteries are still evident on the property. Lead and acid from the batteries, along with potential polychlorinated biphenyls (PCBs) and dioxin from transformer recycling or burning are potential causes of concern.

4.7.2.2 Stellan Fuel Maintenance Yard

The fuel/maintenance yard is located in the southeast corner of the project site. The yard is about 15 years old and was formerly a salvage area. Two buildings, an office, and a maintenance garage currently occupy the yard. The entire area is comprised of fill material from building demolition consisting of wood, concrete, shingles, brick debris, and tires. Wetlands predominate along the northwest area of the property. The lot contains three diesel fuel pumps, underground lines, and a large (8000 gallon) above-ground fuel storage tank. There are also two 275 gallon oil tanks used for heating alongside the maintenance garage. Trucks and trailers are stored onsite, and oil/fuel stains are present on the surface.

4.7.2.3 Fiftieth Avenue

On both sides of this street, proceeding northerly from Stellan Fuel Maintenance Yard, miscellaneous debris has been dumped. The western side of the

street, in particular, has debris that extends from the street approximately 20 to 30 feet into wetlands (ERT, 1985). The rubbish includes leaves, grass clippings, old furniture, shingles, building demolition debris, trash, automobile parts, broken asphalt, bricks, and appliances.

4.7.2.4 Old Junkyard At End of Main Street Between 51st Avenue and Railroad Right-of-Way

This area consists of mounds of buried debris, rubble, tires, auto parts, concrete debris, crushed drums, motor oil cans and paint cans. The area extends approximately 20 feet west of the rail right-of-way (ROW) and adjacent to Main Street (ERT, 1985). Most of the debris has been covered and vegetated with wild grasses and naturally occurring trees/shrubs.

4.7.2.5 Jen's Chun King Facility

This former industrial facility is located in the northeast corner of the site and consists of one large and several smaller buildings. The property surrounding the buildings is littered with miscellaneous empty tanks and food processing equipment. The southern section of the parcel contains wetlands. A small electric substation is located at the southern edge of the main building. Two underground tanks containing gasoline are also located in this general vicinity. Two underground tanks, apparently containing fuel oil, are located along the northern edge of the property. Current activities at the building include a tire company and a furniture stripping business.

4.7.2.6 Excavating Business on 52nd Avenue

The excavating business has been in operation for three years (ERT, 1985). The garage on the site contains a machine shop, hydraulic fluids, solvents, and motor oils. The remainder of the property contains numerous 40-foot truck trailers used for storage, three mobile office trailers, scaffolding, excavation equipment, three empty 275-gallon oil tanks, and miscellaneous empty pails marked as grout, paint, or methyl ethyl ketone. There are no underground tanks onsite.

4.7.2.7 Don's Auto Body on 55th Avenue

The auto body shop is located in a new building on the western edge of the project site. The building is used for auto body work and painting. Paints are stored in a separate room. According to the owner, spent paint thinners are collected and disposed of offsite by a hazardous waste hauler (ERT, 1985). No underground tanks are onsite.

4.7.2.8 Moline, Inc.

The Moline, Inc. plant is located adjacent to the project site, and has operated at this location since 1955. Prior to Moline, Inc., an auto parts operation was located on the property. Moline, Inc. manufactures baking equipment, employing machinists, welders, sheetmetal workers, assemblers, and platers. The hazardous wastes that are generated are manifested and hauled offsite (ERT, 1985). There is one fuel tank in the basement of the

building. The parcel has been filled over the years, to within 20 to 50 feet of Keene Creek, with miscellaneous clean gravel, clay, and rubble consisting of asphalt pavement and concrete.

4.7.3 Existing Contamination from Waste Materials

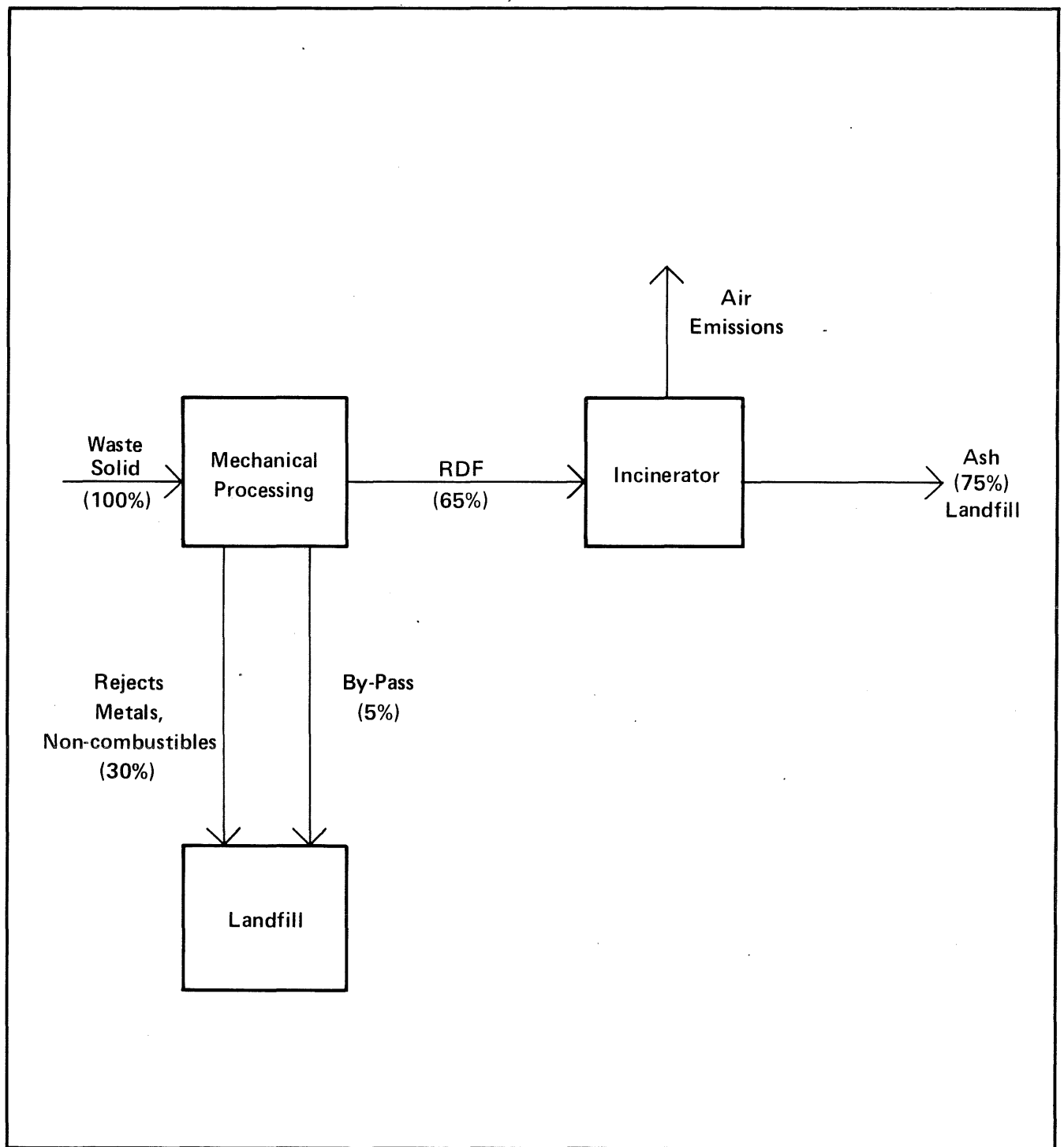
The soil and groundwater on the project site have been sampled and analyzed to determine potential contamination from the existing waste sources. The limited information to date indicates some elevated lead and PCB concentration in the Union Compressed Steel scrapyard soil, and a high concentration of solvents in the groundwater near the Old Junkyard at 51st Avenue and Main Street. A summary of these investigations is provided in Section 4.6. Additional investigations of the soil and groundwater quality will be conducted in the near future to better define the extent and source of the contamination. This sampling will also include dioxin, halogenated, and nonhalogenated hydrocarbons.

4.7.4 Existing Solid Waste Generation and Disposal

The project area is primarily composed of residential units, with scattered commercial facilities and limited industrial operations. The bulk of the waste generated in the project area is mixed municipal solid waste that is collected and transported to the regional solid waste processing facility in Duluth operated by the Western Lake Superior Sanitary District (WLSSD). The WLSSD Resource Recovery Facility employs a process to convert municipal solid waste to refuse derived fuel (RDF). The RDF is mixed with sewage sludge and burned in the WLSSD fluidized bed incinerator. Figure 4.7-1 is a flow diagram of the operation of the Resource Recovery Facility. Approximately 5% of all municipal refuse entering the WLSSD facility is estimated to end up a bypass refuse. Bypass refuse is not processed through the RDF process because of downtime associated with mechanical failures or periodic maintenance. Rejects and noncombustibles are separated from the incoming waste and amount to about 30% of the total waste stream. Ash production is only averaging 7.5% of the incoming waste volume (Knight, 1985).

All the wastes from the WLSSD facility are being disposed in the WLSSD owned and operated sanitary landfill at Rice Lake. This landfill has an approved permit from MPCA (Chapter 7035), but it expires in 1986. WLSSD currently is planning to renew the permit to continue disposal operations on this site (Knight, 1985).

The Rice Lake landfill has substantial operating capacity available on the current site, but has several operational problems. The Federal Aviation Administration (FAA) has concerns over the sea gulls attracted to the site because of the proximity of the Duluth Airport to the landfill. The FAA has restricted the landfill to nonputrescible wastes in an effort to mitigate the sea gull problem. Historical waste disposal operations at the Rice Lake site generated leachate that substantially degraded surface and ground water quality around the property. WLSSD installed a leachate "interception" system to collect the discharge, and improvement in water quality has been observed. The site has been listed, however, on the Minnesota Superfund list as a result of the leachate generation from the old landfill. Remedial



**Materials Flow Around
RDF Facility**

Figure 4.7-1

investigations are underway to assess the pollution problem and any threat to human health or the environment.

Hazardous waste currently generated on the project site by existing operations are being handled by private haulers in accordance to State of Minnesota Rules Chapter 1045, with disposal occurring out of the state.

4.7 References

Environmental Research & Technology, Inc., 1985. Duluth Paper Mill - Solid Waste, P-D864-700, prepared for PNTA-MPL, Concord, MA.

ERT, see Environmental Research & Technology, Inc.

4.8 ECOLOGY

The existing baseline terrestrial and aquatic ecosystems associated with the project site are discussed in this section. These descriptions were based on literature review, consultation with experts, and field reconnaissance. Since specific studies of the site are generally lacking, much of the discussion relates to potential organisms that may occur in light of onsite habitats and species/habitat associations described in the literature.

4.8.1 Terrestrial Ecology

This section describes existing terrestrial baseline conditions at the project site. Both vegetation and wildlife are discussed.

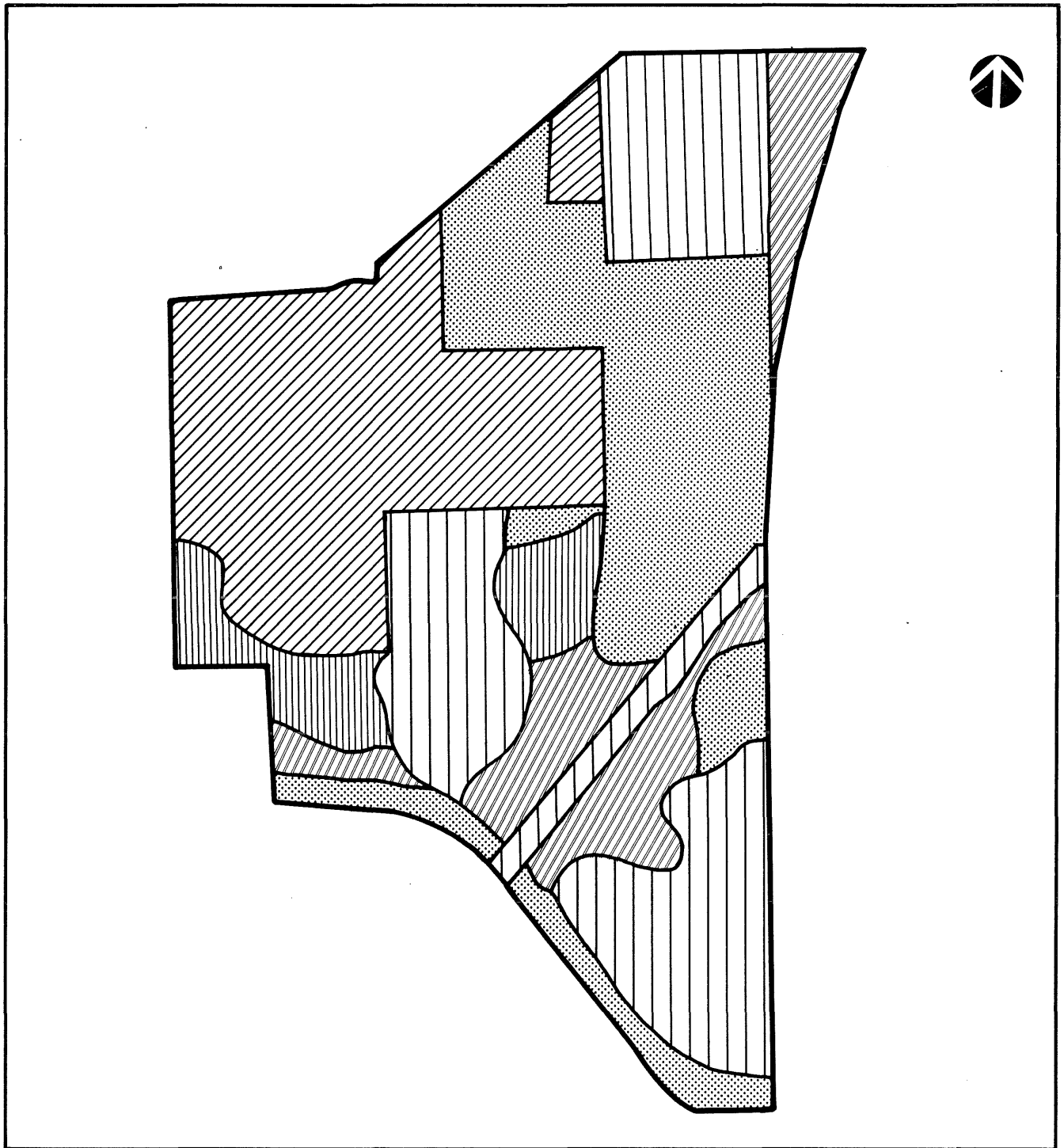
4.8.1.1 Vegetation

There are five habitat/land cover types present on the project site. These include residential areas, industrial land, open fields, wetland areas, and woodlands. The distribution and acreage of each is given in Table 4.8-1 and Figure 4.8-1, respectively. Residential areas comprise about 28 percent of the project site or 26 acres. Mature hardwoods, ornamental trees and a variety of unidentified shrubs are present throughout the residential area. Highly disturbed industrial areas cover 25 acres or 27 percent of the site.

The open fields, which comprise approximately 25 acres or 27 percent of the site, typically occur in gently-sloping upland areas and are dominated by forb and grass species with a few scattered deciduous trees. Potentially common species present in these areas include wheatgrass, squirreltail, common tansy, ragweed, yarrow, goldenrod, and sweetclover. Scattered clumps of trees include species such as green ash, American elm, boxelder, and birch.

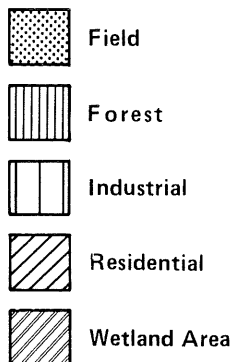
Table 4.8-1. Approximate Acreages for Cover Types Identified at the Project Site

Open fields	25 Acres
Woodland	5 Acres
Industrial/vacant	25 Acres
Residential	26 Acres
Wetland areas	11 Acres
Total project area	91 Acres



Not to Scale

Legend



Source: ERT, 1985.

**Habitat/Land Cover Types of
the Project Site**

Figure 4.8-1

The wetland areas which occupy 11 acres or 12 percent of the site are concentrated in the southeastern corner of the site and along the eastern edge adjacent to the St. Louis River. The marsh areas located south and south-east of the former junkyard (Figure 4.4-1) and adjacent to the shoreline are dominated by cattails, arrowhead, sedges, rushes, and bur reed, with small clumps of willows and dogwood scattered throughout. Duckweed commonly occurs at the surface of the standing water pockets. A larger wetland area also exists directly east of the project site. The railroad system intersects and borders this area. Dominant vegetation in this part of the site is similar to the other wetland areas. Birch, alder, and willow shrubs are interspersed throughout the wet areas at the site. The drier areas within these communities are commonly occupied by red-osier dogwood and reed canary grass.

The wooded bottomland along Keene Creek contains dense stands of deciduous trees that include balsam poplar, American elm, ash, maple, and birch. Common woody understory species potentially occurring along the creek include willow, red-osier dogwood, and alder. A younger stand of deciduous trees is also present northeast of the scrapyard (Union Compressed Steel Company). Together, these areas occupy 5 acres or about 5 percent of the site.

4.8.1.2 Wildlife

Terrestrial wildlife resources in the project vicinity include avifauna and mammals. The avifauna include several important species due to their nesting patterns and/or their endangered status.

Birds

Considering the habitat types present, a number of passerine, waterfowl, and shorebirds would be expected to be found on or near the site. Certain of the more common birds that might be expected include the house sparrow, starling, common grackle, blue jay, robin, song sparrow, mallard, blue-winged teal, scaup, and killdeer. In light of the rather diverse bird fauna along the St. Louis River, other less common species may also be present. For example, raptors such as the marsh hawk and kestrel, and other waterfowl and shorebirds may use the area, but their occurrence would be expected to be sporadic and in low numbers. Based on the relatively small amount of marsh habitat at the site, there appears to be no unique or critical bird habitat present within the study area. The closest important wetland is Minnesota Grassy Point, which is located about 1 mile south of the site. This area has been proposed as a natural resources management area to protect unique wetlands and shallow waters (Metropolitan Interstate Committee, 1985).

The only species of concern in the immediate study area is the ring-billed gull, which nests on the peninsula east of the Hibbard Station (Lounsbury et al., 1979). The primary importance of this site is that potential displacement of the ring-billed gull to other nesting areas in the vicinity could put stress on two species listed as endangered by Wisconsin; the common tern and the piping plover. Within Minnesota, the piping plover is listed as endangered and the common tern as a species of special concern (MDNR, 1984). Five active nesting sites for the common tern occurred in the St. Louis Harbor in 1985: Sky Harbor Airport, Port Terminal,

Erie Pier, and Interstate and Hearding Islands (Figure 4.8-2) (Davis, 1985). Known active piping plover nesting sites in the harbor in 1985 included the Sky Harbor Airport, Port Terminal, and Erie Pier. It should be noted that both common terns and piping plovers were actively discouraged from nesting at the Port Terminal and Erie Pier (Davis, 1985).

Ring-billed gull nesting on the peninsula usually commences in late April with eggs hatching in May. By late June, chicks are common in the adjoining waters. In early July, adults decrease in numbers until all birds have left by late July. During one season, 1372 ring-billed gulls were observed on the peninsula with an average density of 810 birds per 1000 m² (Lounsbury, et al., 1979). Other gull and tern species probably use the bays at times, but no nesting colonies are known to occur in the vicinity of the site.

Mammals

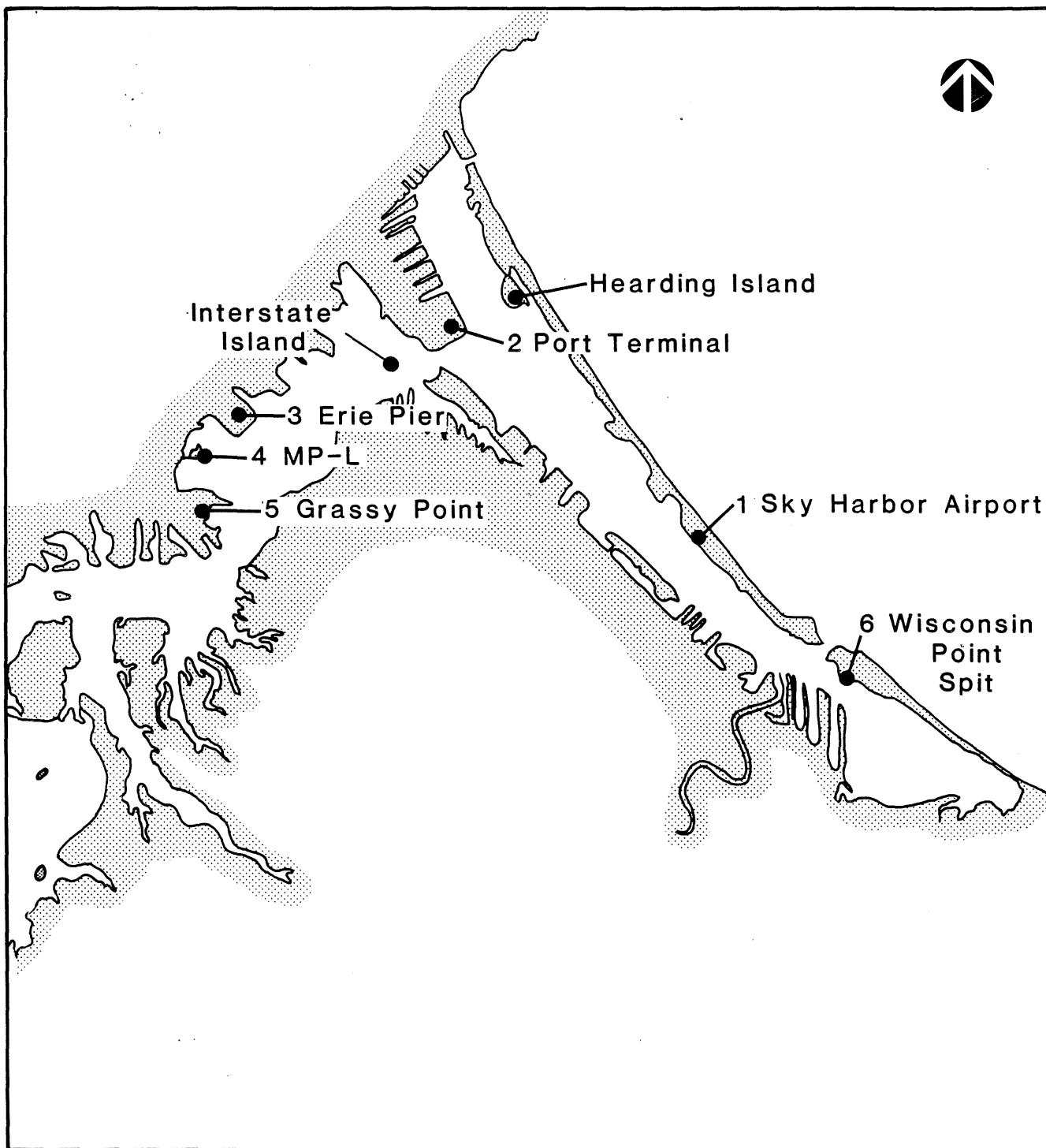
No mammal surveys have been conducted at the project site. However, considering observations made along the Waterfront Trail System located several miles upstream (Niemi et al., 1978), a number of species could potentially occur at the site. Among the more common species that could be present are the cottontail rabbit, woodchuck, muskrat, raccoon, and thirteen-lined ground squirrel. Additional species are listed in the Ecology Technical Report (ERT, 1985). The potential habitat value for mammals at the site is low because of the extent of residential and industrial development, as well as the disturbed nature of the natural habitats.

4.8.2 Aquatic Ecology

Aquatic environments located within or adjacent to the project site and the Hibbard Station include the St. Louis River and Keene Creek (Figure 4.2-4). In the vicinity of the site, the St. Louis River is a broad, expansive estuary with numerous bays and shipping channels. There are two shallow bays, 2 to 7 feet deep, on either side of the Hibbard Station. The main shipping channel is located about 1500 feet from the Hibbard Station, where depths range from about 23 to 27 feet (ERT, 1985).

No aquatic macrophytes were observed in either of the two bays near the Hibbard Station; however, extensive riparian vegetation was observed along Keene Creek (ERT, 1985). Chemical characteristics of the St. Louis River and Keene Creek are described in Section 4.2.

Bottom substrates in the south bay adjacent to the Hibbard Station are quite variable depending upon the location. Bottom substrate surveys conducted at three locations in the south bay revealed hard rock and sand with rip-rap, hard sand with rip-rap, and bark overlying gravel as the dominant forms (MPL, 1977). In contrast, bottom substrates in the north bay consisted entirely of hard, silty-sand. Keene Creek, which traverses the southwest corner of the site, is a tributary of the St. Louis River. Based on observations made in September 1985, the characterization of the stream segment in the project site included a width of about 15 to 18 feet, a depth of 1 to 3 feet, gravel as the dominating substrate, and relatively long riffles with short pools (ERT, 1985).



Source: Metropolitan Interstate Committee, 1985

**Ring-Billed Gull, Common Tern,
and Piping Plover Nesting Sites
and Managed Areas, 1985**

Figure 4.8-2

4.8.2.1 Fish

Fish resources in the St. Louis River near the project site consist of both cold water and warm water fisheries. Based on surveys conducted in the bays adjacent to the Hibbard Station, 27 species are known to be present (ERT, 1985). Besides these species, 2 additional species have been collected near Grassy Point: silver redhorse (Moxostoma anisurum) and pumpkinseed (Lepomis gibbosus) (WDNR, 1982). Both of these species could potentially occur near the site along with other species such as the common shiner (Notropis comutus), spottfin shiner (Notropis spiloptenis), bluegill (Lepomis macrochirus), and largemouth bass (Micropteros salmoides) that occur in the St. Louis River (ERT, 1985). No threatened or endangered fish species are known to occur in the St. Louis River (Johnson, 1985).

Studies conducted adjacent to the Hibbard Station revealed that yellow perch, white sucker, walleye, and northern pike caught by gill netting; black bullhead, white sucker, and yellow perch caught by trap netting; and yellow perch, white sucker, walleye, emerald shiner, and spottail shiner caught by electrofishing to be the most abundant fish species (greater than 10 percent of the total catch) (MPL, 1977; MDNR, 1980a,b, 1983). Of the species that are known to occur near the Hibbard Station, walleye, northern pike, smallmouth bass, black crappie, and yellow perch represent game fish (Johnson, 1985). In terms of relative abundance and fishery value, walleye and yellow perch are considered to be the major game fish in the vicinity of the site (Johnson, 1985). The remaining fish are considered as minor game fish, forage, or rough fish.

Important game fish spawning areas in the bays adjacent to the Hibbard Station are unknown (MPL, 1977). Forage species such as emerald shiner and spottail shiner and rough fish such as white suckers are known to spawn in the bays in the area (Johnson, 1985). Substrate around the Hibbard Station may be poor for spawning due to fly ash deposits. Most of the known major spawning areas for walleye, northern pike, and yellow perch are found upstream of the Arrowhead Bridge (DeVore, 1977). Allouez Bay and Grassy Point have also been identified as major spawning areas for northern pike (Schram, 1982).

The primary value of the bays adjacent to the Hibbard Station is that they serve as nursery grounds, particularly for game fish such as walleye, yellow perch, and possibly northern pike (DeVore, 1977). Ichthyoplankton entrainment studies conducted in the vicinity of the cooling water discharge of the Hibbard Station provide data on the seasonal abundance of fish larvae in the south bay (Table 4.8-2). The most abundant species in the entrainment samples included yellow perch during May through June, rainbow smelt during May, black bullhead during August, walleye during June through July, and white sucker during July. Although fish larvae were present from May through October, the largest numbers were collected during May through July. Seining and trawling surveys in other bays of the lower portion of the St. Louis River indicated that young-of-the-year yellow perch, spottail shiner, emerald shiner, alewife, and logperch are quite abundant (DeVore and Hargis, 1982). Trawling surveys conducted near Grassy Point revealed standing crops of dominant species to range from 72 to 3486 yellow perch per

Table 4.8-2. Monthly Range of Ichthyoplankton Densities (Larvae/1000m³) Collected in the South Bay in the Vicinity of the Cooling Water Discharge from the Hibbard Station (1975)

Larvae	April	May	June	July	August	October
Alewife	0	0.3-3.4	0	0	0	0
Black bullhead	0	0	0	0	0-32.1	0
Bluegill	0	0	0	0	0	0.7
Emerald shiner	0	0	0.1	0	<0.1	0
Rainbow smelt	0	1.1-191.0	1.6-3.3	0-0.3	0	1.5
Spottail shiner	0	0-0.2	0	0-0.4	0	0
Trout-perch	0	0	0	0	0-0.2	0
Walleye	0	0	0.3-15.8	<0.1-21.6	0-0.5	0
White sucker	0	0	1.6-2.9	0-17.6	0-2.0	0
Yellow perch	0	170.4-750.0	0.1-1099.2	<0.1-318.3	0-4.4	0

Source: MPL, 1977.

hectare, 1289 to 3558 spottail shiner per hectare, 826 to 1170 logperch per hectare, 119 to 1026 johnny darter per hectare, and 39 to 71 walleye per hectare (DeVore and Hargis, 1982).

The bays near the Hibbard Station are not considered to be critical forage area for walleye, yellow perch, or northern pike (DeVore, 1977). The preferred foraging areas for these game fish appear to be in bays with slightly greater depths and more vegetation.

Aquatic surveys have not been conducted in Keene Creek. Based on fish composition in other tributaries of the St. Louis River, probable species to occur in Keene Creek include rainbow smelt, sculpins, white sucker, longnose sucker, brown trout, brook trout, minnows, and dace (Johnson, 1985). Trout in the lower section of Keene Creek probably occur as drift, since the preferred adult habitat and spawning areas are located above the Duluth escarpment beginning about 5 miles upstream from the mouth.

4.8.2.2 Benthic Macroinvertebrates

The only known benthic macroinvertebrate study conducted near the vicinity of the Hibbard Station was carried out in the cooling water discharge, which mainly identified drift macroinvertebrates that were entrained (ERT, 1985). The dominant invertebrates included the crustacean, Gammarus sp., and the dipteran, Chaoborus, which comprised 64 and 33 percent of the total organisms, respectively. Densities for these two taxa ranged from 0 to 816/m³ (Chaoborus) and 0.5 to 75/m³ (Gammarus sp.). Other less abundant macroinvertebrate groups in the samples included caddisflies, leeches, clams and true bugs. Benthic macroinvertebrate surveys conducted in the vicinity of the Arrowhead Bridge revealed abundant tubificid worms with densities ranging from 574 to 22,891 organisms/m² (MDOT, 1979). Other less abundant invertebrates included snails, dipterans (Chironomus spp.), and crustaceans (Gammarus sp. and Pontoporeia sp.). Studies conducted at other locations in the lower portion of the St. Louis River indicated similar composition (Koch et al., 1976; Peterson, 1979; Carlson and Thomas, 1984).

4.8.2.3 Zooplankton

A rather diverse planktonic crustacean community is present in the south bay adjacent to the Hibbard Station (ERT, 1985). Of the 23 taxa collected during quarterly sampling in 1975, the dominant species were the cladocerans, Diaphanosoma leuchtenbergianum, Daphnia galeata mendotae, and Bosmina coregoni; and the copepods, Diaptomus oregonensis and Mesocyclops edax (MPL, 1977). Crustacean densities in the bay indicated a moderately productive community. Information describing rotifer communities, which often represent an important component of zooplankton, are lacking.

4.8.2.4 Phytoplankton

Phytoplankton communities in the south bay adjacent to the Hibbard Station are dominated by diatoms and green and blue-green algae (MPL, 1977). Based on a quarterly sampling program in 1975,

diatoms predominated in the spring and fall, while green algae dominated in the summer. In the spring, the diatom, Stephanodiscus hantzschii, was the most abundant taxon. By early summer, green algae such as Sphaerocystis schroeter, Ulothrix, spp., and unidentified unicell species; and the blue-green alga, Oscillatoria, were dominant. The most notable change in the summer was the shift in dominance from the green to the blue-green algae, Aphanizomenon flos-aquae and Anacystis cyanea. In the fall, diatoms and green algae once again dominated the phytoplankton with Cyclotella bodanica, Melosira granulata, and S. hantzschii. Similar species composition and seasonal variations have been described in areas located both upstream and downstream of the site (Carlson and Thomas, 1984).

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4.9 ECONOMIC AND SOCIAL CONDITIONS

The project will affect the economic and social conditions found in the Duluth area. The following section contains discussions of the existing population, economy, housing, and community services and facilities.

4.9.1 Population

Two study areas are important to the economic and social conditions surrounding the project. The geographic boundaries of these study areas were determined by the location of the mill and by the distance workers would generally be willing to travel to commute to work. The primary study area consists of the cities of Duluth, Minnesota and Superior, Wisconsin. The mill would be located in western Duluth in a neighborhood known as West Duluth, fairly close to the Bong Bridge that connects Duluth with Superior. It is anticipated that many of the impacts associated with the mill would affect only Duluth; however, many economic and social interactions occur between the two cities.

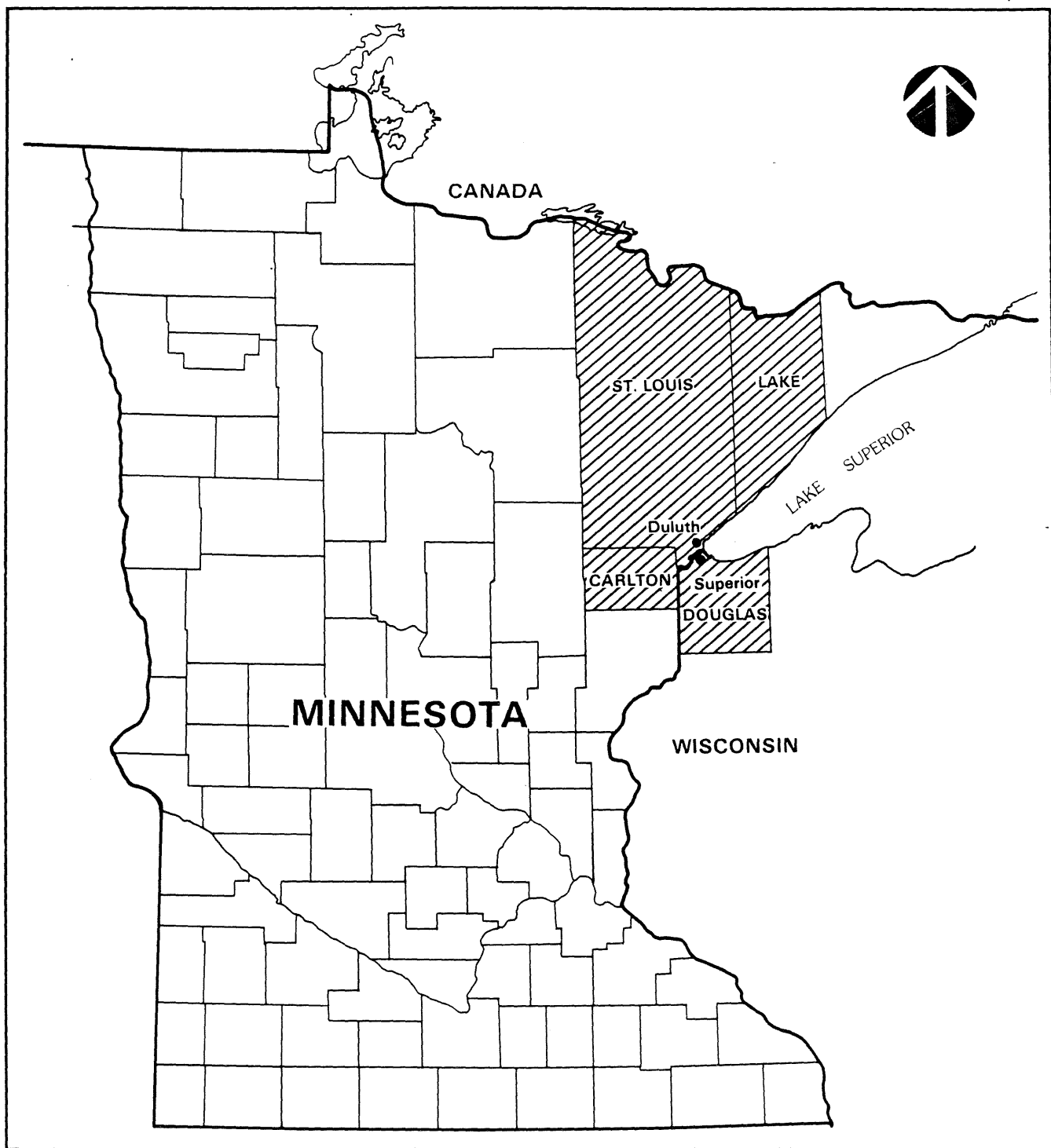
The secondary study area consists of four counties, as shown in Figure 4.9-1. It includes St. Louis County, Minnesota, where Duluth is located and Douglas County, Wisconsin, where Superior is located. The other two counties, Carlton County and Lake County, Minnesota, have been added as the four counties together are expected to encompass the majority of mill workers' residences as determined by a maximum commuting distance of 40 to 50 miles on interstate routes.

Within the State of Minnesota, Duluth is located in a regional planning district known as the Arrowhead Region. This region includes seven north-eastern Minnesota counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis. The 1980 population of the Arrowhead Region was 343,344, about 8.4 percent of the State's total population.

4.9.1.1 Past Population Trends

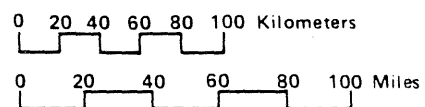
Data describing recent population trends in the secondary study area, the Arrowhead Region, the States of Minnesota and Wisconsin, and the United States are presented in Table 4.9-1. Some of the trends that have occurred in the secondary study area and in the region are quite different from those in the two states and the nation. During the 1960s, the populations of Minnesota and Wisconsin increased by 11.5 percent and 11.8 percent, respectively, while the United States population as a whole increased by 13.3 percent. During that same decade, the population of the secondary study area decreased by 3.6 percent and the population of the Arrowhead Region decreased by 4.5 percent. While the urban population of the two states and the nation all increased by more than 15 percent, it decreased in the study area and region by about 7 percent. Relatively small gains or losses occurred in the rural population of each of the geographic areas shown in Table 4.9-1 during the 1960s.

During the 1970s, the populations of Minnesota and Wisconsin each increased by more than 6 percent, and the United States population grew by 12 percent. In the secondary study area, however, the population declined slightly and in the region it decreased by 3.6 percent. The urban popula-



Legend

 Counties Included in the Secondary Study Area



Secondary Study Area

Figure 4.9-1

Table 4.9-1. Recent Population Trends in the Secondary Study Area, Arrowhead Region, Minnesota, and Wisconsin, 1960-1980

Geographic Area	1960			1970			1980		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Secondary study area ^a	318,230	223,425	94,805	306,773	208,325	98,448	309,629	211,435	98,194
Urban, rural % of total		70.2	29.8		67.9	32.1		68.3	31.7
% change ^b	-	-	-	-3.6	-6.8	+3.8	+0.9	+1.5	-0.3
Arrowhead region ^c	344,957	203,531	141,426	329,603	189,298	140,305	343,344	197,635	145,709
Urban, rural % of total		59.0	41.0		57.4	42.6		57.6	42.4
% change ^b	-	-	-	-4.5	-7.0	-0.8	+4.2	+4.4	+3.9
Minnesota	3,413,864	2,122,566	1,291,298	3,806,103	2,531,801	1,273,170	4,075,970	2,725,202	1,350,768
Urban, rural % of total		62.2	37.8		66.4	33.6		66.9	33.1
% change ^b	-	-	-	+11.5	+16.0	-1.1	+7.1	+7.3	+5.4
Wisconsin	3,951,777	2,522,179	1,429,598	4,417,821	2,910,418	1,507,313	4,705,767	3,020,732	1,685,035
Urban, rural % of total		63.8	36.2		65.9	34.1		64.2	35.8
% change ^b	-	-	-	+11.8	+15.4	+5.4	+6.5	+3.8	+11.8
United States	179,323,175	125,268,750	54,054,425	203,211,926	149,324,930	53,886,996	226,545,805	167,050,992	59,494,813
Urban, rural % of total		69.9	30.1		73.5	26.5		73.7	26.3
% change ^b	-	-	-	+13.3	+19.2	-0.3	+12.0	+11.9	+10.4

Sources: U.S. Department of Commerce, 1971b.
U.S. Department of Commerce, 1981.

a. Consists of four counties: Carlton, Lake and St. Louis Counties, Minnesota and Douglas County, Wisconsin.

b. Since previous decade.

c. Consists of seven northeastern Minnesota counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis.

tions of Minnesota and Wisconsin increased by 7.6 percent and 3.8 percent, respectively, during the decade while the increase for the nation was 11.9 percent. The urban population of the region increased by 4.4 percent during the 1970s and increased in the secondary study area by less than about 2 percent. Rural population shifts during the decade were relatively minor in the study area and region, but were more substantial in Minnesota, Wisconsin, and the United States as each area had an increase in rural population of more than 6 percent.

Population shifts have occurred in the region and in the secondary study area over the decades partly as a result of the chronic swings in the steel and iron mining industries. As indicated in Table 4.9-2, over 15,000 people left the four counties of the secondary study area between 1960 and 1970. While an increase of about 13,700 persons occurred during the 1970s, the population in the secondary study area has declined in recent years and was estimated to include 303,143 persons in 1985 as shown in Table 4.9-2.

In the primary study area, both Duluth and Superior have experienced approximately an 8 percent decrease in population with a loss of about 7800 persons in Duluth and 2700 in Superior. As indicated by the 1985 population estimates of 86,396 for Duluth and 27,665 for Superior, the populations of these two cities have continued to decrease since 1980.

4.9.1.2 Population Projections

The projected population shifts for the four county secondary study area are shown in Table 4.9-3 for the years 1990 through 2010. Carlton County (864 square miles) and Douglas County (1305 square miles), are each projected to have small increases in population, generally at a declining rate, over future years. Lake County (2053 square miles) and St. Louis County (6125 square miles), are projected to have population decreases in the future. The population is expected to decline at an increasing rate in Lake County and at an uneven rate in St. Louis County. These projections reflect past population changes occurring in the counties resulting from shifts in industries and occupations in both rural and urban parts of the counties.

For the secondary study area as a whole, the population is projected to hover around 300,000 persons during the 1990s, and then decline by less than 1 percent every five years until 2010. The population shifts for the northeastern Minnesota region as a whole have been recognized as a result of a fluctuating economic base, which has been targeted for remedial action.

4.9.2 Economy of the Region and Area

According to the Arrowhead Regional Development Commission, northeastern Minnesota's economy has been driven for many years by the steel and iron mining industries. The region has also been characterized as having a main economic base of taconite mining, timber, transportation, and tourism. In recent years, the region's economy has suffered from a decline in taconite production reflecting the decline in the domestic steel industry and the increase in raw material imports (Arrowhead Regional Development Commission, 1985).

Table 4.9-2. Population of the Arrowhead Region, Secondary Study Area, and the Primary Study Area, 1940-1985

Geographic Area	1940	1950	1960	1970	1980	1985 ^a
Arrowhead region ^b	308,906	305,885	344,957	329,603	343,344	342,061
Secondary study area						
Carlton County, MN	24,212	24,584	27,932	28,072	29,936	30,911
Lake County, MN	6,956	7,781	13,702	13,351	13,043	12,564
St. Louis County, MN	206,917	206,062	231,588	220,693	222,229	216,995
Douglas County, WI	<u>47,119</u>	<u>46,715</u>	<u>45,008</u>	<u>44,657</u>	<u>44,421</u>	<u>42,673</u>
Total	285,204	285,142	318,230	306,773	309,629	303,143
Primary study area						
Duluth, MN	101,065	104,511	106,884	100,578	92,811	86,396
Superior, WI	<u>35,136</u>	<u>35,325</u>	<u>33,563</u>	<u>32,237</u>	<u>29,571</u>	<u>27,665</u>
Total	136,201	139,836	140,447	132,815	122,382	114,061

Sources: U.S. Department of Commerce, 1971b.
U.S. Department of Commerce, 1982a.
Minnesota Department of Energy, Planning and Development, 1983.
Wisconsin Department of Administration, 1985a.

a. Estimated.

b. The Arrowhead region consists of seven northeastern Minnesota counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis.

Table 4.9-3. Population Projections for the Secondary Study Area,
1990-2010

Geographic Area	1990	1995	2000	2005	2010
Carlton County, MN	31,952	32,874	33,488	33,902	34,176
% change ^a	-	2.9	1.9	1.2	0.8
Lake County, MN	12,100	11,795	11,379	10,974	10,553
% change ^a	-	-2.5	-3.5	-3.6	-3.8
St. Louis County, MN	212,060	211,741	210,272	209,097	207,730
% change ^a	-	-0.2	-0.7	-0.6	-0.7
Douglas County, WI	43,904	43,978	44,301	44,512	44,711
% change ^a	-	0.2	0.7	0.5	0.4
Secondary study area	300,016	300,388	299,440	298,485	297,170
% change ^a	-	0.1	-0.3	-0.3	-0.4

Sources: Minnesota Department of Energy, 1983.
Wisconsin Department of Administration, 1985b.

a. Since previous 5-year estimate.

The City of Duluth is the major city in northeastern Minnesota and its economic activity fluctuates with seasonal changes, particularly because of the closing of the port during the mid-winter months. The Duluth-Superior Harbor is the western terminus of the Great Lakes-St. Lawrence Seaway and it has for many years been one of the principal ports of the world in tonnage handled. The port of Duluth-Superior is the largest volume port on the Great Lakes, as more than 40 million metric tons of international and domestic cargoes are shipped through the port in an average 10 month season (Duluth Area Chamber of Commerce, 1985). Grain is the primary export commodity, while iron ore and taconite shipments make up the bulk of domestic traffic. Metal products, twine, machinery, coal, cement, newsprint, lumber, and general cargoes also move through Duluth on an average of nearly 300 ocean vessels and hundreds more Great Lakes ships annually. In 1979, the U.S. Commerce Department designated the Port of Duluth as a Foreign Trade Zone. Duluth also serves as a major retail, government, and educational center for the area, and the city retains a significant amount of industry.

4.9.3 Employment and Income Trends

The distribution of wage and salary covered employment by industry in the Arrowhead Region in 1977 and 1982 is presented in Table 4.9-4. The average number of firms in the region decreased by about 2 percent during those five years, from 7388 to 7219 firms, but some economic sectors had gains, while others lost. The sectors that lost firms (and the percentage lost) were: construction (11 percent), manufacturing (7 percent), mining (6 percent), and trade and government (4 percent each). Economic sectors gaining in the number of firms between 1977 and 1982 were: agriculture, forestry, and fisheries; transportation and utilities; finance, insurance, and real estate; and services.

The trade sector of the economy employed the greatest percentage of employees in the region in 1982, with about 24 percent of the workforce. Other large employment sectors were: government (22 percent), services (20 percent), manufacturing (13 percent), and mining (10 percent). Less than 5 percent of the region's workers in 1982 were employed in each of the remaining sectors: transportation and utilities; finance, insurance and real estate; construction; and agriculture, forestry, and fisheries.

Employment by industrial sector in the primary and secondary study areas in 1980 is presented in Table 4.9-5. In the secondary study area, St. Louis County had the largest workforce in 1980, with 88,521 persons or 73 percent of the workers in the four counties. Thus, St. Louis County, heavily influences the employment by sector breakdown for the area. The largest industrial sectors in the secondary study area in 1980 were: professional and related services (23.4 percent), retail trade (18.4 percent), manufacturing (12.4 percent), and mining (9.7 percent). Transportation and public utilities was also a large sector of employment, with 9.4 percent of the area workers. These five sectors employed about 89,356 persons, or 73 percent of the employed persons in the secondary study area.

Employed persons in Duluth and Superior, whose numbers were also included in the secondary study area analysis, totaled 51,136 persons in 1980. Of that number, 39,072 persons or 76 percent of the workers resided in Duluth. The largest sectors of employment in these cities, or the primary study area, in

Table 4.9-4. Distribution of Wage and Salary Covered Employment by Industry in the Arrowhead Region, 1977-1982

	Average No. of Firms		Annual Average Employment				Total Wages Paid (In Thousands)		Average Annual Wage		Average Weekly Wage	
	a		Actual		% of Total		b					
	1977	1982	1977	1982	1977	1982	1977	1982	1977	1982	1977	1982
Agr., forestry, fishery	75	78	345	393	0.3	0.4	2,231	3,653	6,467	9,295	124	179
Mining	51	48	11,639	10,123	10.5	9.7	193,426	277,736	16,619	27,436	320	528
Construction	764	683	6,110	3,442	5.5	3.3	104,558	74,112	17,113	21,532	329	414
Manufacturing	493	460	15,876	13,238	14.3	12.6	197,934	258,300	12,467	19,512	240	375
Transportation, utilities	387	396	5,477	5,107	4.9	4.9	78,094	105,925	14,259	20,741	274	399
Trade	2,780	2,664	26,565	25,058	24.0	23.9	192,147	239,428	7,233	9,555	139	184
F.I.R.E. ^c	527	533	3,457	3,715	3.1	3.5	32,535	49,969	9,411	13,451	181	259
Services	1,920	1,982	18,806	20,639	17.0	19.7	150,241	265,869	7,989	12,882	154	248
Government	391	375	22,459	23,106	20.3	22.0	243,223	380,075	10,830	16,449	208	316
Total	7,388	7,219	110,734	104,821	100.0	100.0	1,194,389	1,655,067	10,786	15,789	207	304

Source: Arrowhead Regional Development Commission, 1985.

a. Based on January through September 1982 data.

b. Based on January through September 1982 data and annualized to 12 month total.

c. Finance, insurance, and real estate.

Table 4.9-5. Employment by Individual Sector in the Primary and Secondary Study Areas, 1980

	Carlton County	Lake County	St. Louis County	Douglas County	Secondary Study Area		Duluth	Superior	Primary Study Area	
					Number	%			Number	%
Employed persons, 16 years and over ^a	10,935	4,890	88,521	17,404	121,750		39,072	12,064	51,136	
Agriculture	343	32	607	189	1,171	(1.0)	141	41	182	(0.4)
Forestry and fisheries	8	55	370	32	465	(0.4)	141	5	146	(0.3)
Mining	63	941	10,810	11	11,825	(9.7)	162	9	171	(0.3)
Construction	731	628	5,059	998	7,416	(6.1)	1,760	580	2,340	(4.6)
Manufacturing	2,854	481	9,171	2,571	15,077	(12.4)	4,713	1,612	6,325	(12.4)
Nondurable goods	1,526	84	4,011	1,185	6,806	(5.6)	2,360	812	3,172	(6.2)
Durable goods	1,328	397	5,160	1,386	8,271	(6.8)	2,353	800	3,153	(6.2)
Transportation, communications and other public utilities	742	469	7,669	2,577	11,457	(9.4)	4,217	1,765	5,982	(11.7)
Wholesale trade	288	36	3,131	781	4,236	(3.5)	1,587	545	2,132	(4.2)
Retail trade	1,829	780	16,368	3,471	22,448	(18.4)	7,799	2,564	10,363	(20.3)
Finance, insurance, and real estate	369	111	3,417	599	4,496	(3.7)	1,672	443	2,115	(4.1)
Business and repair services	299	31	2,417	338	3,085	(2.5)	1,239	241	1,480	(2.9)
Personal, entertainment, and recreation services	360	255	3,568	693	4,876	(4.0)	1,762	528	2,290	(4.5)
Professional and related services	2,494	782	21,127	4,146	28,549	(23.4)	11,583	3,055	14,638	(28.6)
Health services	1,182	266	8,670	1,530	11,648	(9.6)	4,620	1,119	5,739	(11.2)
Educational services	1,003	403	8,573	1,870	11,849	(9.7)	4,667	1,341	6,008	(11.7)
Other profession and related services	309	113	3,884	746	5,052	(4.1)	2,296	595	2,891	(5.7)
Public administration	555	289	4,807	998	6,649	(5.5)	2,296	676	2,972	(5.8)

Source: U.S. Department of Commerce, 1983a.

a. Full-time employment.

1980 were similar to those of the secondary study area, with the exception of mining. The four largest sectors in the primary study area were: professional and related services (28.6 percent), retail trade (20.3 percent), manufacturing (12.4 percent), and transportation and public utilities (11.7 percent).

Personal income by type and broad industrial source in the secondary study area and in Minnesota and Wisconsin in 1980 are presented in Table 4.9-6. The 1980 per capita income levels in the secondary study area ranged from \$7170 in Lake County to \$8924 in St. Louis County. The per capita income in the primary study area was \$8543. These figures are somewhat low in comparison with the Minnesota and Wisconsin 1980 per capita income averages of \$9662 and \$9361, respectively. The largest economic sectors for personal income by place of work are comparable to the largest employment sectors for the secondary study area, as they include government and professional services, mining, manufacturing, construction, and retail trade.

As shown in Table 4.9-7, there has been a decline in the total number of employed workers in the Arrowhead Region, in the Minnesota counties of the secondary study area, and in Duluth between 1980 and 1984.

The declines over those four years in the areas are estimated to be: Arrowhead Region, 7.5 percent; Carlton County, 2.9 percent; Lake County, 33.3 percent; St. Louis County, 10.2 percent; and Duluth, 12.3 percent. From these estimates, it is clear that Duluth and St. Louis County have been suffering large employment losses in the past few years (Arrowhead Regional Development Commission, 1985).

Firms or industries that left the Duluth area in recent years included the closures in 1982 of Jeno's, Inc. (800 manufacturing jobs), Duluth Airbase (1500 government jobs), and American Hoist and Derrick (235 manufacturing jobs). Other large business closures in the Arrowhead Region have included the 1984 closing of the Boise Cascade Insulite plant (585 manufacturing jobs) and the permanent closure of Butler Taconite (650 mining jobs) in May of 1985. Numerous small businesses have also closed in Duluth and the region in the past few years (Arrowhead Regional Development Commission, 1985).

Minnesota Department of Employment Services unemployment data for 1976 through early 1985 are presented in Table 4.9-8 for areas in the Arrowhead Region, Minnesota, and the U.S. The worst levels of unemployment by yearly averages were incurred in 1982 and 1983 in all of the areas shown. In 1983, the average percentage of unemployed workers ranged from 12.9 in Carlton County to 29.7 in Lake County. In Duluth, that figure was 13.2 percent in 1983, while in the remainder of St. Louis County the average was 22.6 percent. Unemployment in 1983 in the Arrowhead Region averaged 18 percent, compared to 8.2 percent in Minnesota and 9.6 percent in the United States.

While the 1984 and early 1985 unemployment levels in all the areas shown in Table 4.9-8 have improved, these figures can be misleading as they do not show how many workers left the area (Table 4.9-7), or the number of workers who are jobless and whose unemployment benefits have expired. The seasonal nature of unemployment in these areas, the state, and the nation can be glimpsed from the monthly unemployment rates shown for 1984 and part of

Table 4.9-6. Personal Income by Type and Broad Industrial Source in the Secondary Study Area, Minnesota, and Wisconsin, 1980

	Carlton County	Lake County	St. Louis County	Douglas County	Secondary Study Area	Minnesota	Wisconsin
<u>Labor and Proprietors Income</u>							
<u>By Place of Work (\$1000)</u>							
<u>By Type</u>							
Wage and salary disbursements	125,429	74,979	1,260,937	231,169	1,692,514	24,836,979	26,844,916
Other labor income	14,342	8,624	126,488	20,157	169,611	2,417,487	2,724,699
Proprietors income	10,761	3,068	74,194	16,893	104,916	3,058,041	3,207,205
Farm	1,608	(L)	1,751	2,780	(N)	1,176,556	1,338,529
Non-farm	9,153	3,032	72,443	14,113	98,741	1,881,485	1,868,676
<u>By Industry</u>							
Farm	2,133	(L)	2,830	3,274	(N)	1,377,257	1,635,682
Non-farm	148,399	86,627	1,458,789	264,945	1,958,760	28,935,250	31,141,138
Private	117,683	76,961	1,190,281	215,507	1,600,432	24,732,701	26,838,405
Agricultural services	248	91	1,889	192	2,420	95,407	104,027
Mining	655	(D)	306,610	(L)	(D)	432,727	54,739
Construction	8,128	12,719	91,868	14,734	127,449	1,885,649	1,672,286
Manufacturing	62,423	6,744	133,156	38,404	240,727	7,603,264	11,477,822
Non-durable goods	40,661	89	58,908	12,402	112,060	2,886,333	3,736,941
Durable goods	21,762	6,655	74,248	26,002	128,667	4,716,931	7,740,881
Transportation and public utilities	9,935	(D)	140,354	74,772	(D)	2,419,293	2,064,271
Wholesale trade	3,442	885	85,773	25,734	115,834	2,543,160	1,959,385
Retail trade	14,376	4,748	147,394	27,468	193,986	3,004,182	3,020,664
F.I.R.E. ^a	4,450	1,461	44,702	5,710	56,323	1,733,205	1,549,489
Services	14,026	5,896	238,535	28,491	286,948	5,015,914	4,935,722
Government	30,716	9,666	268,508	49,438	358,328	4,202,549	4,302,733
Federal civilian	1,517	1,168	40,687	2,885	46,257	651,233	570,374
Federal military	436	464	19,086	665	20,651	90,547	71,023
State and local	28,763	8,034	208,735	45,888	291,420	3,460,769	3,661,336
<u>Total by Place of Work (\$1000)</u>	150,532	86,671	1,461,619	268,219	1,967,041	30,312,507	32,776,820
<u>Total by Place of Residence (\$1000)^b</u>	220,593	93,594	1,983,165	347,658	2,645,010	39,444,820	44,262,258
<u>Per Capita (\$)</u>	7,377	7,170	8,924	7,806	8,543	9,662	9,361

Source: U.S. Department of Commerce, 1985.

D = Not shown to avoid disclosure of confidential information.

L = Less than \$50,000.

N = Not calculated.

a. Finance, insurance, and real estate.

b. Includes labor and proprietor income plus dividends, interest, rent, and transfer payments. This is obtained by adjusting labor and proprietor income to account for persons who live in one county but work in another.

Table 4.9-7. Annual Labor Force Estimates for the Arrowhead Region,
Selected Counties and Duluth, 1980-1984

Year	Arrowhead Region	Carlton County	Lake County	St. Louis County	City of Duluth
1980	148,628	12,408	6409	97,801	40,169
1981	147,030	11,868	5873	96,722	40,148
1982	148,624	12,108	5275	98,411	38,106
1983	143,123	11,997	4589	93,039	36,293
1984	137,414	12,052	4272	87,801	35,256

Source: Arrowhead Regional Development Commission, 1985.

Table 4.9-8. Percent Unemployed in the Arrowhead Region, Minnesota,
and United States, 1976-1985

Year	Carlton County	Lake County	St. Louis County	City of Duluth	St. Louis County Excluding Duluth	Arrowhead Region	Minnesota	United States
1976	8.5	6.5	7.4	6.3	8.4	7.8	5.9	
1977	7.9	6.6	7.9	6.8	8.9	8.3	5.1	7.1
1978	5.8	4.0	5.1	4.8	5.4	5.5	3.8	6.1
1979	6.6	4.0	5.8	5.6	6.0	6.4	4.2	5.8
1980	9.6	11.7	9.2	7.7	10.3	10.3	5.9	7.1
1981	9.6	7.4	8.2	7.6	8.6	9.0	5.5	7.6
1982	12.2	27.2	17.3	10.8	21.4	17.0	7.8	9.7
1983	12.9	29.7	18.9	13.2	22.6	18.0	8.2	9.6
1984	11.1	16.2	12.4	9.1	14.8	12.5	6.4	7.5

Source: Arrowhead Regional Development Commission, 1985.

1985. Unemployment in Duluth is generally higher during the coldest winter months when the port is not active. The data for unemployed workers by industry are shown in Table 4.9-9. On September 12, 1985, there were approximately 116 construction workers and 183 service sector workers receiving unemployment insurance benefits in St. Louis County excluding Duluth. In Duluth, the comparable figures were 49 construction workers and 163 service sector workers. The combined number of workers receiving unemployment insurance benefits in the occupations of machine trades, benchwork, and structural work in all of St. Louis County declined slightly from 441 workers on September 12, 1984 to 405 workers on September 12, 1985 (Minnesota Department of Economic Security, 1985).

4.9.4 Housing

The occupancy status of year-round housing units is presented in Table 4.9-10. The housing units are categorized as owner-occupied, renter-occupied, or vacant. Vacant units may be available homeowner or rental units, or they may be units that are vacant and not for sale or rent. Vacant units intended for seasonal occupancy and vacant units held for migratory labor are not included in census reports.

As indicated in Table 4.9-10, there were 120,418 year-round housing units in the secondary study area in 1980. This is an increase of 17 percent from the 1970 total of 103,275 (U.S. Department of Commerce, 1971a). In 1980, a vast majority of these housing units were located in St. Louis County, which had 86,619 housing units or 72 percent of the total in the area. Sixty-nine percent of the housing units in the secondary study area were owner-occupied, well above the U.S. average of 60 percent.

In the primary study area in 1980, only 61 percent of the year-round housing units were owner-occupied. Duluth and Superior had slightly higher percentages of renter-occupied housing in comparison to the U.S. average of 33 percent. Duluth had 34 percent of its 37,064 units occupied by a renter and Superior had 36 percent of its 11,982 units occupied by a renter. These percentages are also significantly higher than the Minnesota and Wisconsin averages for renter-occupied units which were 27 percent and 30 percent, respectively. Mobile homes in Duluth comprised only 2 percent of the housing stock; and in Superior, mobile homes comprised only 4 percent. In West Duluth, there were 1449 housing units in 1980, with owner-occupied units comprising about 66 percent of the total, and rental units accounting for 29 percent (U.S. Department of the Census, 1983b).

The vacancy rate for owner-occupied and renter-occupied units serves as an indicator of the availability of housing. The homeowner and rental vacancy rates for 1980 are provided in Table 4.9-11 for the primary and secondary study areas. The homeowner vacancy rate in the secondary study area was 1.1 percent in 1980. This is a slight increase over the 1970 rate, when the area had a 1 percent homeowner vacancy rate (U.S. Department of Commerce, 1971a). The rental vacancy rate also increased from 6.7 percent in 1970 to 7.7 percent in 1980 (U.S. Department of Commerce, 1971a). In 1980, Lake County had the highest rental vacancy rate (14.8 percent), while Douglas

Table 4.9-9. Insured Unemployed Workers by Industry
in St. Louis County and Duluth

Number of Workers	September 12, 1984		September 12, 1985	
	St. Louis County Excluding Duluth	Duluth	St. Louis County Excluding Duluth	Duluth
Agriculture, forestry fishing	4	0	3	1
Mining	1,644	25	811	5
Construction	112	43	116	49
Manufacturing				
Durable	79	57	180	79
Non-Durable	105	68	43	36
Transportation and public utilities	37	36	35	31
Wholesale trade	54	34	70	30
Retail Trade	115	108	124	143
Finance, insurance, real estate	28	26	17	16
Service	222	148	183	163
Public administration	23	24	42	22
Information not available	13	8	15	5
TOTAL	2,436	577	1,639	580

Source: Minnesota Department of Economic Security, 1985.

Table 4.9-10. Year-Round Housing Units by Occupancy Status, 1980

Geographic Area	Total	Owner Occupied, Number (%)	Renter Occupied, Number (%)	Vacant Units ^a , Number (%)
<u>Primary Study Area</u>				
Duluth	37,064	22,816 (61.6)	12,547 (33.9)	1,701 (4.6)
Superior	11,982	7,247 (60.5)	4,253 (35.5)	482 (4.0)
Total	49,046	30,063 (61.3)	16,800 (34.3)	2,183 (4.5)
<u>Secondary Study Area</u>				
Carlton County	10,934	8,313 (76.0)	1,795 (16.4)	826 (7.6)
Lake County	5,011	3,754 (74.9)	824 (16.4)	433 (8.6)
St. Louis County	86,619	59,728 (69.0)	21,754 (25.1)	5,137 (5.9)
Douglas County	17,854	11,643 (65.2)	4,824 (27.0)	1,387 (7.8)
Total	120,418	83,438 (69.3)	29,197 (24.2)	7,783 (6.5)
Minnesota	1,529,363	1,035,689 (67.7)	409,533 (26.8)	84,141 (5.5)
Wisconsin	1,752,969	1,127,367 (64.3)	524,894 (29.9)	100,708 (5.7)
United States	86,678,392	51,787,104 (59.7)	28,591,179 (33.0)	6,300,109 (7.3)

Source: U.S. Department of Commerce, 1982b.

a. Includes vacant homeowner and rental units, housing units that are vacant and not for sale or rent.

Table 4.9-11. Vacancy Rates for Homeowner and Rental Units, 1980

Geographic Area	Vacant Homeowner Units, ^a Number	Homeowner Vacancy Rate	Vacant Rental Units, ^a Number	Rental Vacancy Rate
<u>Primary Study Area</u>				
Duluth	207	0.9	973	7.2
Superior	44	0.6	210	4.7
Total	251	0.8	1,183	6.6
<u>Secondary Study Area</u>				
Carlton County	109	1.3	171	8.7
Lake County	42	1.1	143	14.8
St. Louis County	664	1.1	1,892	8.0
Douglas County	153	1.3	238	4.7
Total	968	1.1	2,444	7.7
Minnesota	15,772	1.5	25,215	5.8
Wisconsin	14,849	1.3	27,631	5.0
United States	949,254	1.8	2,029,974	7.1

Source: U.S. Department of Commerce, 1982b.

a. Number of vacant units is calculated: $\text{Number vacant} = (\text{Vacancy rate} \times .01) \times \text{number occupied} \div 1 - (\text{Vacancy rate} \times .01)$

County had the lowest rental vacancy rate (4.7 percent). In the two cities in 1980, Duluth had a rental vacancy rate of 7.2 percent, while Superior had a much lower rental vacancy rate of 4.7 percent.

In 1980, the owner-occupied vacancy rate in Minnesota and Wisconsin was 1.5 percent and 1.3 percent, respectively, while it was 1.8 percent nationally. Therefore, the secondary study area's average owner-occupied vacancy rate of 1.1 percent was slightly lower than those of the two States, and much lower than the national average. The rental unit vacancy rate of 7.7 percent was considerably higher than the rates for Minnesota and Wisconsin (5.8 percent and 5 percent, respectively), and also higher than the U.S. rate of 7.1 percent. Thus, compared with state and national vacancy rates, there appeared to be a surplus of rental units in the secondary study area in 1980, but a limited supply of housing for owner occupancy. This trend was mirrored in the primary study area, as the average homeowner vacancy rate was only 0.8 percent in 1980, while the rental vacancy rate for the area was 6.6 percent.

Due to loss of population in recent years in the study area and region, both owner-occupied and rental housing vacancy rates have been increasing, making the different types of housing more obtainable. In 1983, a real estate broker counted 1700 homes for sale in Duluth, due to migration of jobless workers. The availability of existing homes for sale in 1983 on a monthly level was equal to the total annual amount in preceding years (ERT, 1985). During the last two weeks in November and the first two weeks in December 1985, 749 homes were listed for sale in the Duluth area, including 180 homes in West Duluth. The average list price was \$47,984. During that period, the average market time for housing listings was 139 days. Vacancy rates over the past year in the 10,415 taxable rental units in Duluth apartment buildings ranged from 5 to 10 percent in newer buildings and were about 25 percent or higher in older buildings (built before 1960) (Wells, 1985).

Temporary housing in the area is available in hotels and motels. There are 48 motels/hotels in the Duluth and Superior metropolitan area, with 1626 rooms available in Duluth and 630 rooms in Superior (Duluth Convention and Visitors Bureau, 1985; Superior Chamber of Commerce, 1985).

4.9.5 Community Services and Facilities

Community services and facilities in the primary study area of Duluth, Minnesota and Superior, Wisconsin include education, medical/health services, law enforcement, fire protection, water supply, wastewater treatment, solid waste, and recreation. The purpose of this analysis is to determine whether these facilities have excess capacity that could accommodate additional population or related demands.

4.9.5.1 Education

The City of Duluth is served by Independent School District 709 and the City of Superior is served by the Superior School District. There are 17 elementary, 4 junior high, and 3 senior high schools in Duluth that serve a total enrollment of 13,712 students. The schools are currently operating at approximately 17 percent below capacity. According to the projected enrollment figures, enrollment will decrease to 20 percent below capacity by the

1989-1990 school year. The student to teacher ratio for the district as a whole is about 24:1 (Juola, 1985). Approximately 1325 additional students are enrolled in 13 private and parochial schools (Duluth Area Chamber of Commerce, 1985). The community of West Duluth is served by 5 elementary, 1 junior high, and 1 senior high school. These schools are currently operating at almost 22 percent below capacity (Juola, 1985).

There are 9 elementary, 2 junior high, and 1 senior high school in Superior that serve a total enrollment of 5466 students. The schools are currently operating at approximately 13 percent below capacity. According to the projected enrollment figures, enrollment will decrease to 18 percent below capacity by the 1989-1990 school year. The student to teacher ratio is about 22:1 (Heebink, 1985). There is 1 parochial school in Superior (Superior Chamber of Commerce, 1982).

There are 6 institutions of higher learning serving the primary study area: 3 four-year institutions and 3 vocational/technical schools. The graduate programs of the colleges and the training programs of the vocational schools are focused on community and social services.

4.9.5.2 Medical/Health Services

The primary study area is served by 4 hospitals, 3 of which are located in Duluth: Miller-Dwan Medical Center, St. Luke's Hospital, and St. Mary's Medical Center. These 3 hospitals are licensed for 981 beds (and 70 bassinets), therefore providing 10.6 beds per 1000 residents (Duluth Area Chamber of Commerce, 1985). These hospitals serve a regional population. The hospital in Superior is Memorial Hospital and it is licensed for 162 beds (Venneau, 1985). Memorial Hospital provides 5.5 hospital beds per 1000 residents. There are 174 practicing physicians in the City of Duluth and 30 in the City of Superior (Health Systems Agency of Western Lake Superior, 1985; Venneau, 1985). The 1980 ratio of physicians per 1000 residents was 1.9 and 1.0 for Duluth and Superior, respectively. Many Superior residents use the medical and health services in Duluth.

Gold Cross Ambulance, a privately-owned ambulance service, provides emergency ambulance service in Duluth. Nine ambulances are available and all ambulance personnel are professional paramedics (Duluth Area Chamber of Commerce, 1985). The Douglas County Ambulance Service provides two ambulances for the City of Superior with an additional ambulance for the rest of the county and employs 18 full-time and 5 part-time certified paramedics (Collyard, 1985).

4.9.5.3 Law Enforcement

In the City of Duluth, law enforcement is provided by the Duluth Police Department which currently employs 134 fulltime officers and 38 civilian support personnel (Duluth Area Chamber of Commerce, 1985). The department provides about 1.4 police officers per 1000 residents. In the City of Superior, law enforcement is provided by the Superior Police Department

which currently employs approximately 60 sworn officers, 40 of whom work on patrol duty (Superior Police Department, 1985). In 1980, the ratio of police officers per 1000 residents was 2.0.

4.9.5.4 Fire Protection

Fire protection service in Duluth is provided by the Fire Department's 150 paid fire fighters who staff 9 stations located throughout the city (Duluth Area Chamber of Commerce, 1985). In 1980, the ratio of fire fighters per 1000 dwelling units was 4.2, which is more than twice a minimum recommended fire fighter service ratio of 2 fire fighters per 1,000 dwelling units (Stenehjem and Metzger, 1976). The department has 19 vehicles that are available for deployment to any major or minor incident and has an additional 8 vehicles available for major fires and backup units (Duluth Area Chamber of Commerce, 1985). West Duluth is served mainly by Fire Station No. 8 located at Central Avenue and Cody Street and Station No. 2 at West 27th Avenue and Superior Street. The Superior Fire Department's 51 paid fire fighters staff 3 stations located throughout the city. In 1980, the ratio of fire fighter per 1000 dwellings was almost 4.5. The department has 15 vehicles which are available on a 24-hour, on-call basis (Superior Fire Department, 1985).

4.9.5.5 Water Supply

Duluth's water is received from a point 2 miles into Lake Superior, is pumped at the Lakewood Pumping Station located in eastern Duluth, and is supplied from various storage points located throughout the city. The Lakewood Pumping Station is designed to supply a maximum of 30 million gallons per day (20,833 gpm). The average daily use for the year 1981 was 16.2 million gallons per day (11,250 gpm) (Duluth Area Chamber of Commerce, 1984). The total storage capacity is 68.2 million gallons (City of Duluth, 1983). Duluth's water supply is also described in Section 4.2. Superior's water is supplied by a booster pump located under the Lake Superior beach and transferred underground to the city's water filtration plant. The pump's capacity is 6 million gallons per day. The current average daily use is 4.3 million gallons per day. The total storage capacity is approximately 1.4 million gallons.

4.9.5.6 Wastewater Treatment

The City of Duluth's wastewater treatment plant has an average capacity of 43.6 million gallons per day. The current average number of gallons processed daily by the plant is 36 million (Duluth Area Chamber of Commerce, 1984). Detailed discussion of Duluth's wastewater treatment system is found in Section 4.2. The wastewater treatment plant in Superior has a capacity of 6 million gallons per day. The current average number of gallons processed daily is 4 million gallons (Layman, 1985).

4.9.5.7 Solid Waste

The municipal solid waste generated in Duluth is collected and transported to the Western Lake Superior Sanitary District's Refuse Derived Fuel (RDF) facility located in the City of Duluth. After processing, the wastes are then transported to the Rice Lake sanitary landfill. The Sanitary District

estimates the life of the landfill to be in excess of 20 years, using land within the current landfill site (Knight, 1985). Additional information concerning Duluth's solid waste disposal practices is covered in Section 4.7. The municipal solid waste generated in Superior is collected by the city's hauling service and taken to a disposal site on Wisconsin Point. The large amount of acreage on Wisconsin Point has enabled the city to open "cells" of land, as needed (Layman, 1985). According to the Douglas County Solid Waste Management Plan, the current landfill area has a life expectancy of 20 years (Douglas County Solid Waste Planning Committee, 1981).

4.9.5.8 Recreation

The City of Duluth owns and maintains approximately 7000 acres of parkland and municipal forestland. In addition, the city also maintains approximately 4000 acres of state-owned forest preserves, resulting in a total of 11,000 acres of parkland available to the residents. Duluth has 105 municipal parks and playgrounds which encompass 3264 of these 11,000 acres (City of Duluth, 1984; Duluth Chamber of Commerce, 1985). The City of Superior owns 5292 acres of parkland including 4500 acres of municipal forest and has approximately 30 municipal parks and playgrounds (Layman, 1985).

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4.10 TIMBER HARVESTING

The project will result in a substantial harvest of timber for pulpwood and boiler fuel. The geographic area involved in harvesting timber and sources of competition including a determination of the available surplus for utilized species are described in the following section.

4.10.1 Geographic Area Involved in Harvesting Timber

The range of the five species to be harvested for the proposed mill, balsam fir, black spruce, white spruce, aspen, and white birch, includes northeastern Minnesota and northwestern Wisconsin (Little, 1971). Within the northeastern portion of Minnesota, the aspen-birch forest type is fairly evenly distributed throughout the region where it is the dominant type (USDA, 1977). The spruce-fir type is also somewhat evenly distributed, but is sparse compared to the aspen-birch type; however, within portions of Koochiching, Lake, and Cook Counties the spruce-fir type uniformly covers fairly extensive acreages.

A breakdown of the acreages of forest types by forest unit within northeastern Minnesota and northwestern Wisconsin is presented in Table 4.10-1. Forest units for each state are shown in Figures 4.10-1 and 4.10-2. Forest types identified in the table are named after the species forming a plurality of live-tree stocking. It will be noted that aspen occupies the highest percentage of commercial land within each forest unit; balsam fir, black spruce, and white birch within the Aspen-Birch Unit of Minnesota are the only other types covering more than 10 percent of the commercial forest land. Within the Central-Hardwood Unit, four of the five forest types (the white spruce type is not present) under consideration are primarily found in Pine County, Minnesota. Acreages in this county represent between 31 and 77 percent of the total acreage for each type in the entire unit (USDA, 1980a,b).

While data presented above provide information on the geographic distribution of balsam fir, spruce, aspen, and birch, it does not indicate the actual area from which wood would be procured for the project. An estimate of this area has been made by the Minnesota Division of Forestry (Prosek, 1985a). Spruce would likely come from within 175 to 200 miles from Duluth; balsam fir and aspen from within 75 to 100 miles; and birch from within 50 miles.

4.10.2 Surplus Timber

Surplus timber resources within northeastern Minnesota and northwestern Wisconsin are discussed in this section.

4.10.2.1 Minnesota

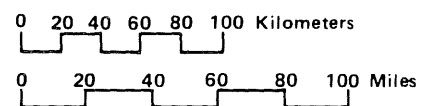
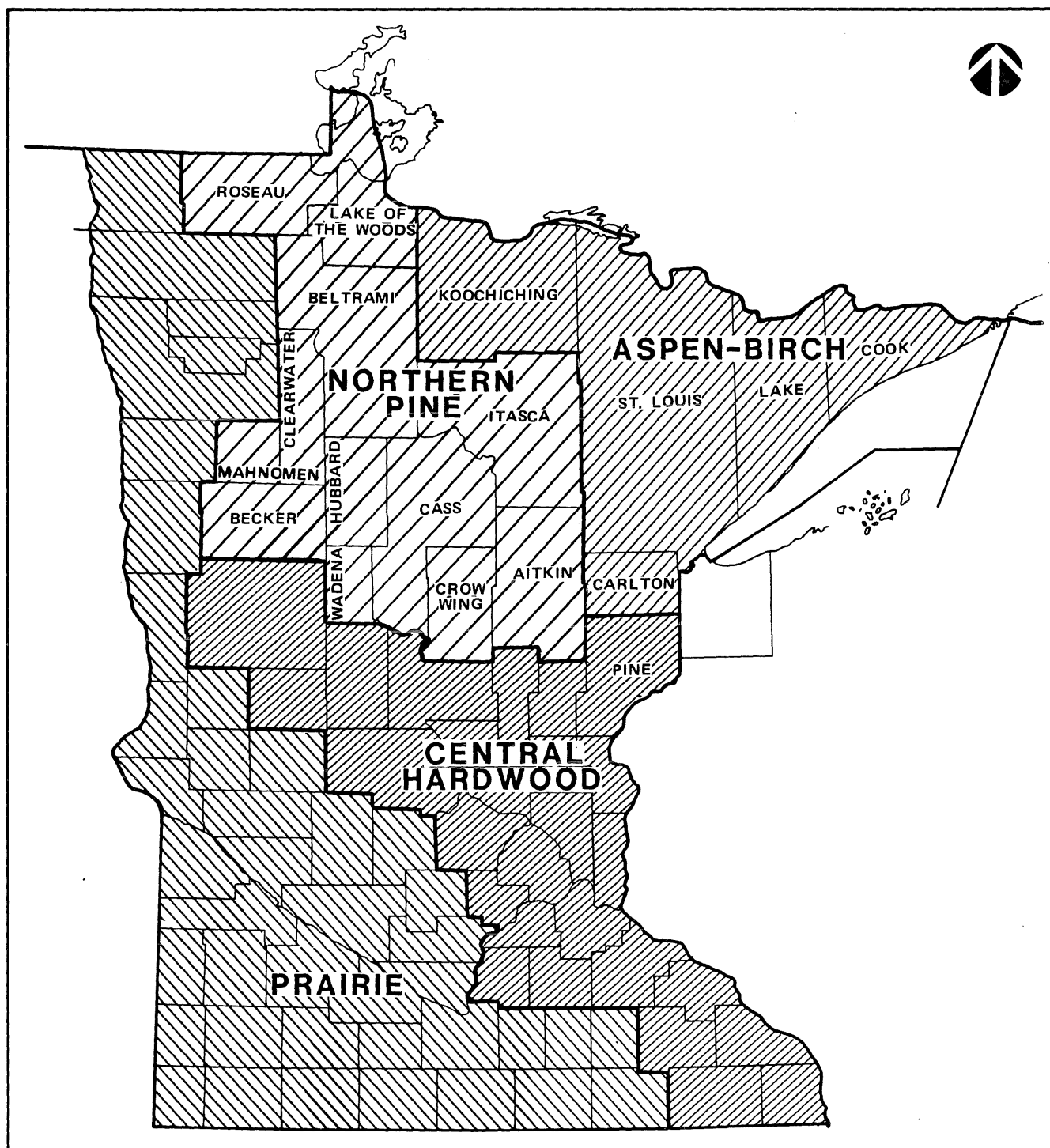
In order to determine the surplus volume of each of the five species of interest, the recommended annual harvest and actual harvest for each was determined (Tables 4.10-2 and 4.10-3). The areas for which data were gathered included the Aspen-Birch and Northern Pine Forest Survey Units, as well as Pine County in the Central Hardwood Forest Survey Unit. The recommended harvest for aspen (Table 4.10-2) has been adjusted upward by 20

Table 4.10-1. Acreages of Forest Type by Forest Unit within
Northeastern Minnesota and Northwestern Wisconsin

Forest Type	Minnesota			Wisconsin
	Aspen-Birch Unit	Northern Pine Unit	Central Hardwood Unit	Northwest Survey Unit
Balsam fir	626.0/11 ^a	225.6/4	7.5/<1	219.6/4
Black spruce	745.7/14	278.2/5	17.9/1	111.2/2
White spruce	60.1/1	19.1/<1	-/-	31.9/<1
Aspen	1947.4/36	2541.7/44	560.2/29	1508.3/29
White birch	546.3/10	371.2/6	80.1/4	268.8/5

Source: Adapted from USDA, 1977, 1979, 1984.

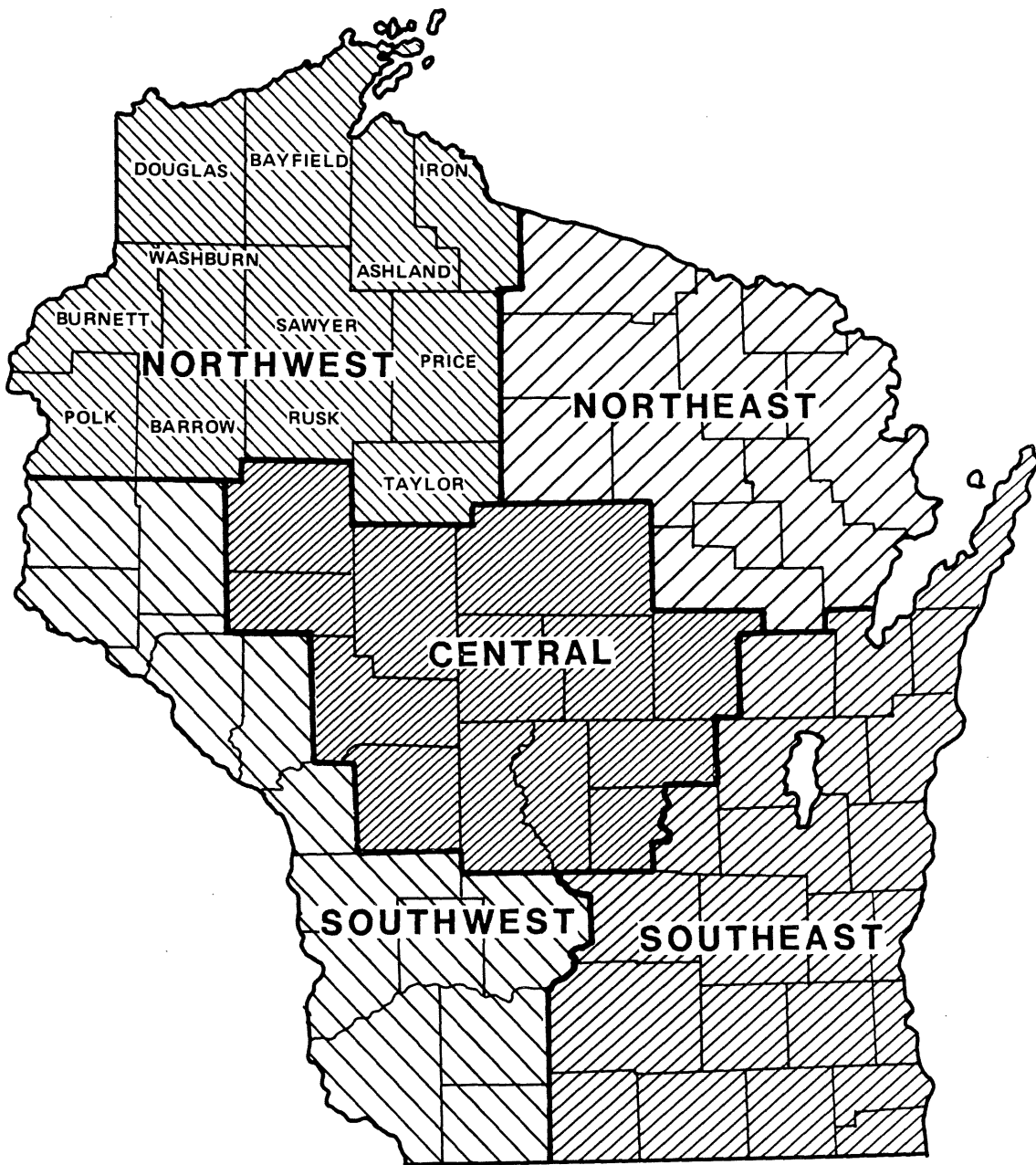
a. Thousands of acres/percent of commercial forest within Unit.



**Forest Survey Units
Within Minnesota**

Source: After USDA, 1979.

Figure 4.10-1



0 20 40 60 80 100 Kilometers

0 20 40 60 80 100 Miles

Forest Survey Units Within Wisconsin

Table 4.10-2. Minnesota Recommended Annual Harvest
of Growing Stock on Commercial Forest Land
by Forest Survey Unit

Forest Survey Unit	Species			
	Balsam Fir	Spruce (Black and White)	Aspen	White Birch
Aspen-Birch	218,368 ^a	158,783	876,683 ^b	252,075
Northern Pine	106,814	44,424	936,433	210,344
Central Hardwood (Pine County Only)	920	746	45,578	10,706
Total ^b	326,102	203,953	1,858,694	473,125

Source: Adapted from County Timber Resource Surveys, Minnesota Department
of Natural Resources, 1977.

a. Cords.

b. Totals adjusted for aspen to reflect a 20 percent increase in allowable
harvest since "rough and rotten" and "short logs" were not included in
the original data (Prosek, 1985b).

Table 4.10-3. Minnesota Pulpwood Production from Roundwood
by Forest Survey Unit

Forest Survey Unit	Species			
	Balsam Fir	Spruce (Black and White)	Aspen	White Birch
Aspen-Birch	50,673 ^a	65,925	562,871 ^b	3164
Northern Pine	39,492	28,953	766,290	855
Central Hardwood (Pine County Only)	-	-	21,293	94
Total	90,165	94,878	1,350,454	4113
Adjusted Total ^b	110,883	102,920	1,492,813	93,413

Source: Blyth, et al, 1985.

a. Standard cords.

b. Totals adjusted using 1979 data to reflect sawtimber and other product (e.g., firewood) removal (Prosek, 1985b). It will be noted that 1979 data on sawtimber and other uses is the most current and that volumes used have not changed significantly since then. In 1979, 15 percent of the balsam fir and aspen, 5 percent of the spruce, and 95 percent of the birch went for sawtimber and other uses. Thus, the 1979 volumes of sawtimber and other uses were calculated based on the above percentages and then added to the 1983 data to give the adjusted total harvest.

percent. This was done because the original surveys did not include two classes of wood which are usable for pulp (Prosek, 1985b). In addition, it should be noted that although these figures are for 1977, they represent the most current data since Minnesota only calculates recommended harvests every 10 years. Harvest data presented in Table 4.10-3 are for pulpwood production. The totals for each species have been adjusted upward to reflect saw timber and other product removals. Other product removals refer primarily to the use of birch as firewood.

Table 4.10-4 summarizes recommended harvest and actual harvest data and provides the 1983 surplus for each species. It should be noted that 80 percent of the allowable harvest for aspen was being used in 1983. The percentages for the remaining species range from 20 to 50 percent.

Since 1983, several events have occurred in northeastern Minnesota that affect the aspen surplus (Prosek, 1985b). In 1984, two mills utilizing a total of 180,000 cords of aspen shut down; and in 1985, a new mill using 70,000 cords was opened. Thus, the net difference of 110,000 cords can be added to the 1983 figures to give an approximate current surplus of 475,881 cords or 26 percent of the allowable harvest.

4.10.2.2 Wisconsin

Current figures for annual timber surplus in the commercial forests of Wisconsin's Northwest Survey Unit, which are based on net annual growth and actual timber harvests, are given in Table 4.10-5. It should be noted that Wisconsin does not calculate recommended annual harvest, but rather uses annual growth. While not the same, these figures are approximations of each other (Beier, 1985a). The data indicate that no more than 35 percent of the net annual growth is currently being used for any species except aspen. With respect to aspen, more wood was harvested than grown; thus, currently there is no surplus for this species in Wisconsin.

4.10.3 Sources of Competition

Sources of competition for balsam fir, spruce, aspen, and birch in Minnesota and Wisconsin are primarily related to the timber industry. However, for balsam fir an additional factor, the spruce budworm, must be taken into consideration.

4.10.3.1 Spruce Budworm

The spruce budworm (*Choristoneura fumiferana*) is one of the most destructive insect pests of spruce-fir forests in North America (Erickson et al., 1978). This insect primarily affects balsam fir, but may also attack white spruce. The present outbreak in Minnesota started in 1954 along the Canadian border. Over the past 30 years, average annual defoliation has been 288,500 acres, fluctuating between 12,000 and 970,000 acres per year (Campbell, 1985). Within this time, there have been three peak levels of infestation; in each case, they coincided with the infestation of new areas. These have included the original infestation along the Canadian border, southeastern St. Louis and southern Lake Counties (infected originally in the late 1960's and early 1970's), and Cook and northeastern Lake Counties (infected in the mid-1980's). The second infestation is ongoing,

Table 4.10-4. Recommended Annual Harvest and Removals (1983)
on Commercial Forest Land in Northeastern Minnesota

Species	Recommended Harvest	Total Timber Removal Percent of Net Recommended Harvest	Difference or Surplus
Balsam Spruce (both black and white)	326,102 ^a	110,883/34	215,219
Aspen	203,953	102,920/50	101,033
White birch	1,858,694	1,492,813/80	365,881
	473,125	93,413/20	379,712

Source: NUS compilation from Tables 4.10-2 and 4.10-3.

a. Cords.

Table 4.10-5. Net Annual Growth (1983) and Removals (1982)
of Growing Stock on Commercial Forest Land in the Northwest
Forest Survey Unit, Wisconsin

Species	Net Annual Growth ^a	Annual Timber Removals ^a Percent of Net Annual Growth	Difference ^a
Balsam fir	150,000	37,000/24	113,000
Spruce (both black and white)	117,000	13,000/11	108,000
Aspen	437,000	554,000/--	-
White birch	185,000	65,000/35	120,000

Source: Adapted from Beier, 1985b.

a. Cord equivalents.

but is predicted to decrease in 1986. The most recent infestation is predicted to increase (Campbell, 1985).

Losses of balsam fir due to budworm defoliation and subsequent mortality have been estimated to be 0.81 cords per acre of defoliation (Campbell, 1985). When the acreage of affected trees from 1983 to 1985 is taken into account (202,800 acres per year), a loss of 164,300 cords per year can be estimated. It should be noted that this volume is taken into account when the Division of Forestry calculates allowable cuts; thus, it is not subtracted from the calculated surplus.

Spruce budworm primarily impacts stands made up of mature trees or those with a dense stocking of fir or a high percentage of fir to other species. These are the types of stands impacted to date. Considering stand structure, past cutting, and the more scattered nature of stands outside of St. Louis, Lake, and Cook Counties, the spruce budworm is not likely to be a problem outside of these counties in the near future (Campbell, 1985).

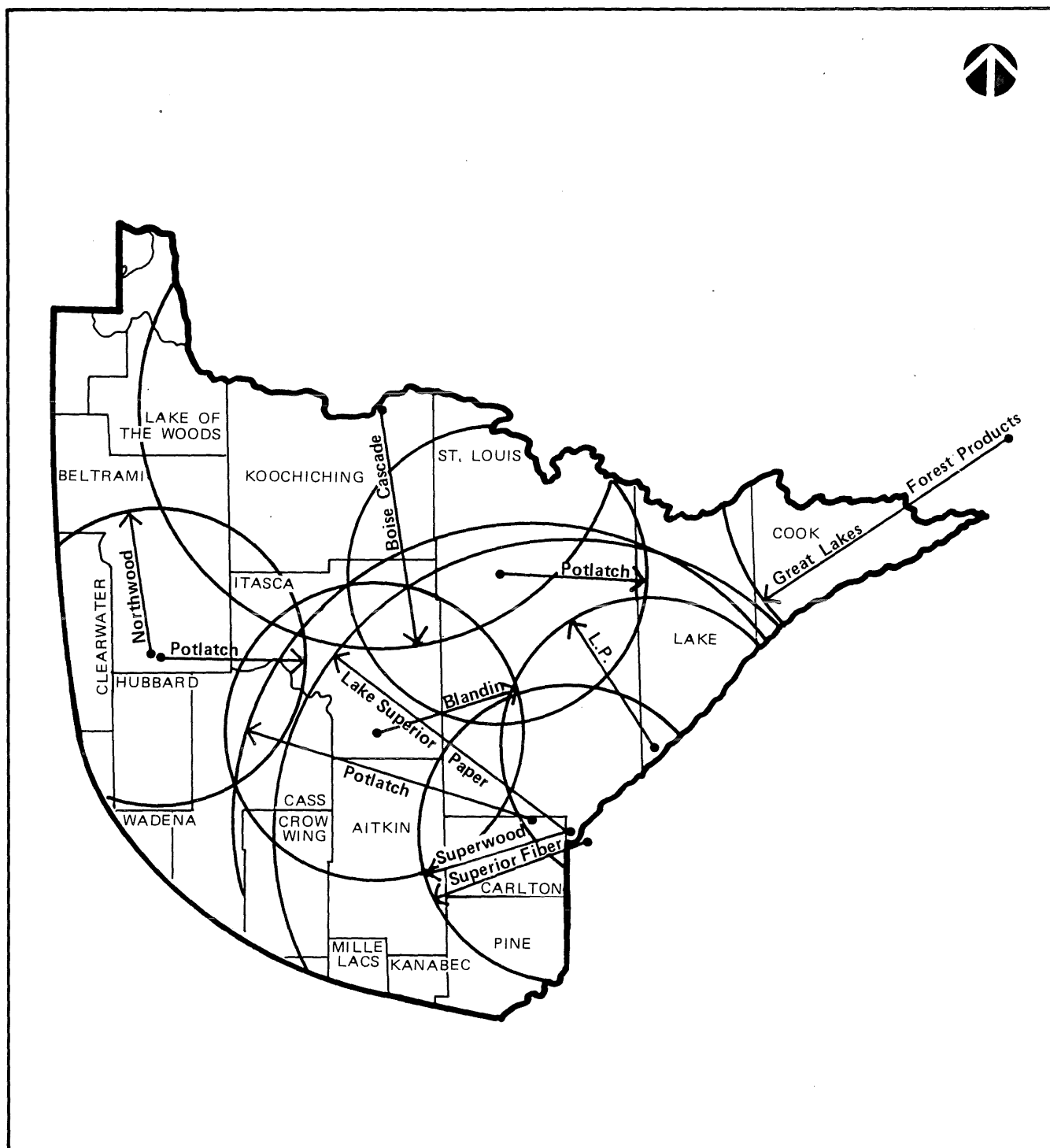
Within Wisconsin, there is currently only one significant budworm infestation which is located in Ashland County (Weber, 1985). This active area covers about 15,000 acres, with mortality being about 33 percent. In general, Wisconsin has not had as extensive infestations as Minnesota due to the fact that spruce-fir acreage is more scattered with almost no large contiguous blocks.

With respect to control of this pest, cutting is an important tool in managing the balsam resource (Campbell, 1985). Proper management can result in changing the age structure of the stand, as well as altering the proportion of balsam to other species. Thus, the budworm would not find the large, susceptible areas of balsam that are currently present in portions of Minnesota.

4.10.3.2 Regional Competition

As discussed above, a surplus is predicated in both Minnesota and Wisconsin for each species to be used by the mill with the exception of aspen in Wisconsin. There are a number of major mills in the region that utilize balsam fir and spruce to produce paper. Within Minnesota, these companies are Potlatch in Cloquet, Blandin in Grand Rapids, Boise Cascade in International Falls, and Champion Paper in Sartell. Within Wisconsin, Consolidated Paper in Wisconsin Rapids uses these species as well; they are also exported to Canada (Prosek, 1985a). Volumes used are not available. However, considering the surplus within both Minnesota and Wisconsin, competition should not be too intensive for these species.

Data on the users of aspen within northeastern Minnesota are presented in Figure 4.10-3. Companies indicated on this figure include those in Wisconsin and Canada that acquire some of their wood in Minnesota. As noted from the figure, the mill would compete with seven other companies within at least part of the area from which it would likely draw aspen. In addition, four other companies, including Northwood and Potlatch in Bemidji, Great Lakes Forest Products in Canada, and Champion Paper in Sartell (not shown), may also compete with the mill, but to a lesser degree.



**Aspen Procurement Areas
of Major Wood Industries
in Northeastern Minnesota**

The increase in demand for aspen, which took a 63 percent jump between 1982 and 1983, has resulted largely from an increase in the production of wafer-board (Prosek, 1985a). It is probable that demand will remain greater for this species than for any other the mill will use.

White birch is presently milled at only one plant, Hedstrom Lumber in Grand Rapids (Pajala, 1985b). The other major use of this species is for home fuel. Considering the surplus for this species (Section 4.10.2.1), competition should not reach significant levels. Data related to a number of new and expanding mills in the area are presented in Table 4.10-6 .

Table 4.10-6. Minnesota: New and Expanding Wood Using Industries

Name	Product	Additional Wood Use
1979-1983		
Potlatch (Cloquet)	Paper	30,000 cds (aspen, Spruce, pine)
Potlatch (Bemidji)	Oriented strand board	120,000 cds (aspen)
Potlatch (Cook)	Oriented strand board	120,000 cds (aspen)
Northwood Panelboard (Bemidji)	Waferboard	200,000 cds (aspen)
Champion Int'l (Sartell)	Paper	60,000 cds (aspen, spruce, pine)
Blandin (Grand Rapids)	Waferboard	150,000 cds (aspen)
1985-1988		
Louisiana Pacific (Two Harbors)	Waferboard	60,000 cds (aspen)
Blandin (Grand Rapids)	Paper	100,000 cds (aspen, spruce, balsam)
Potlatch	Paper	No additional wood
Uncertain		
Louisiana Pacific (Two Harbors)	Waferboard	60,000 cds (aspen)
Champion Int'l (Sartell)	Paper	50-60,000 cds (aspen, spruce, balsam)
Boise Cascade (Int'l Falls)	Paper	300,000 cds (aspen, conifers)
Lake Superior Paper (Duluth)	Paper	231,000 cds (aspen, spruce, balsam)
Louisiana Pacific (Deerwood)	Waferboard	70,000 cds (aspen)

Source: Adapted from Pajala, 1985a.

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CHAPTER 5

IMPACTS AND MITIGATION

5.0 IMPACT AND MITIGATION

This chapter presents discussions of the environmental impacts associated with the project. Impact areas parallel the environmental baseline sections presented in Chapter 4, namely: air, water, noise, transportation, land use/zoning, geology, solid/hazardous waste, ecology, economic/social conditions, and timber harvesting. The information utilized for impact assessment was obtained from the technical reports prepared by Environmental Research and Technology, Inc. and NUS Corporation. These reports were augmented by recent personal communications, additional literature, and field reconnaissance.

5.1 AIR QUALITY AND ODOR

Impacts to air quality are expected from the construction and operation of the proposed project. Expected air quality impacts are discussed in 5.1.1 including the technical approach used in the analyses. Both the proposed action scenario and the fully permitted scenario have been evaluated. The operation of the papermill will be the same in both scenarios. The proposed action calls for Units 3 and 4 at the Hibbard Station to burn a coal/wood chips/sludge combustion mixture (30 percent load yearly average, 50 percent load peak winter conditions) in order to supply steam to the papermill and steam cooperative. The ambient impacts of this case are discussed in 5.1.1. The means to mitigate the adverse air quality impacts of this scenario are discussed in 5.1.2. The fully permitted action scenario represents plant operation to the full extent of permitted levels (100 percent capacity) with Units 3 and 4 burning the coal/wood/sludge mixture and Units 1 and 2 burning #2 distillate fuel oil. The resultant ambient impacts of this case are presented in 5.1.3. The means to mitigate adverse air quality impacts of this fully permitted action are found in 5.1.4. Discussion of the proposed Minnesota acid deposition standard is presented in 5.1.5. Analyses of potential trace metals and fogging/icing conditions are presented in 5.1.6 and 5.1.7, respectively. The air quality implications of the no action alternative are discussed in 5.1.8. Finally, the potential impacts and mitigation associated with project odor sources are discussed in Section 5.1.9.

5.1.1 Impacts of the Proposed Action

Analysis of the impacts of the proposed action includes discussion of the technical approach utilized as well as the resulting ambient impacts associated with both the retrofit of the Hibbard Station and the operation of the papermill. The analysis includes project construction and operational considerations, primarily for the Hibbard Station.

The proposed action calls for the retrofit of Units 3 and 4 of the Hibbard Station to burn a coal, wood chips, waste wood, and sludge mixture (30 percent load yearly average, 50 percent load peak winter conditions) in order to supply steam to the project.

5.1.1.1 Technical Approach

The air quality impacts resulting from operation of the Hibbard Station were estimated using mathematical dispersion models. Air quality modeling is an

analytical tool used to estimate ambient air concentrations caused by pollutant emissions. Screening modeling was performed to estimate ground level concentrations of SO₂, TSP, CO, and NO₂ emitted from the source. Screening modeling techniques, by nature of the model inputs and worst-case meteorological assumptions, produce results which overestimate concentrations.

Model Selection

An analysis of the land use within 3 km of the Hibbard Station, carried out according to an EPA-recommended procedure (EPA, 1981), showed that for purposes of classifying the dispersion environment, the project area was considered nonurban. Thus, rural dispersion models were employed. Because of the topography of the City of Duluth, different screening models were selected for areas with terrain elevations below and above stack top. EPA's Industrial Source Complex Short-Term (ISCST) model (EPA, 1979) was selected to compute short-term concentrations for areas below stack top. This model was selected because some of the modeling runs include stacks whose plumes may be affected by aerodynamic building downwash. EPA's Industrial Source Complex Long-Term (ISCLT) model (EPA, 1979) was used to compute annual concentrations in areas where the terrain elevations were below stack top. Like ISCST, ISCLT will also simulate plume downwash. EPA's Valley model (EPA, 1977a) was used in both short-term and long-term modes to compute concentrations in areas where terrain elevations were above stack top.

Meteorological Input

Worst-case meteorological conditions as specified by (EPA, 1981) were used in the ISCST and Valley short-term screening analysis. The long-term modes of the ISC and Valley models require annual-average meteorological input. Data from Duluth International Airport for 1981-1984 were used in the annual modeling analysis.

Receptor Grids

The receptor grids used in the modeling analysis were dependent upon the topography of the area and the model being used. The ISCST receptor grid consisted of worst-case receptor heights with receptor distances every 100m out to where the terrain exceeds stack height. The ISCLT receptor grid consisted of 36 radials and 10 receptor rings starting at 250m and continuing out to 2500m at 250m intervals. For the Valley short-term model, the initial receptor grid consisted of worst-case receptor heights beginning at terrain height equal to stack top and then proceeding out to 9.0 km at various intervals. For the Valley long-term modeling, two different receptor grids were used. The first grid consisted of receptors from stack location out to a distance of 3200m to ensure dense receptor spacing. The second grid consisted of receptors from stack location out to a distance of 9100m.

Effect of Averaging Time

The ISCST model was run to compute 1-hour concentrations for all pollutants. The 1-hour concentrations were converted to other averaging periods by the following factors, as suggested by (EPA, 1977b):

<u>Averaging Time</u>	<u>Multiplying Factor</u>
3 hours	0.9
8 hours	0.7
24 hours	0.4

The Valley model was run to compute 24-hour concentrations for SO₂ and TSP. Of the short-term ambient standards, only the 24-hour standards were evaluated using Valley in the short-term mode because EPA has not established procedures for converting 24-hour concentrations into other averaging periods.

Ambient Air Quality Background Data

For a screening analysis, pollutants emitted by background sources need not be modeled; rather, their impact is assumed to be accounted for in background concentration data obtained from air quality monitors. Compliance with ambient standards for all pollutants was determined by adding the highest predicted impact from the proposed source to the highest measured background concentration. These background values are listed in Table 5.1-1.

As indicated in Section 4.1, there are primary and secondary particulate non-attainment areas in the vicinity of the Hibbard Station. In order to determine conservative TSP background concentrations in the attainment area, the maximum values at the TSP monitor which recorded the highest concentrations in this area were used. Further details on background determinations are found in the technical report on Air Quality (ERT, 1985a).

Increment Consumption Determination

For a PSD analysis, the baseline data are established when the first completed PSD application for the region has been substituted. For this area, the PSD baseline for SO₂ was triggered in 1978 for the Potlatch facility in Cloquet, Minnesota. The MPCA has agreed that the PSD increment analysis performed for this current study may take credit for retiring the 1978 Hibbard Station baseline emissions. This was accomplished by running the models for both the Hibbard 1978 baseline configuration and the new Hibbard configuration. Consumption of SO₂ PSD increments was determined by subtracting the modeled 1978 baseline concentrations from the modeled new action concentrations expected from the retrofitted Hibbard Station. Because the Potlatch facility is far enough away so that its impacts in Duluth are insignificant, it was not modeled.

5.1.1.2 Construction Phase

Operation of construction equipment, especially those involving earthmoving, will produce both mobile source air emissions and fugitive dust. Construction at the proposed site is anticipated to begin in 1986 and would take

Table 5.1-1. Results of the NAAQS Compliance Analysis-Hibbard Station With 66.45m Stacks^a-Worst Case Proposed Action.

Receptor Location	Pollutant	Model Concentration	Background	Total Concentration	Ambient Standard ^b
Below stack HT	SO ₂				
	1-HR	383.5	235.7	619.2	1300
	3-HR	345.2	151.9	497.1	915
	24-HR	153.4	86.4	239.8	365
	Annual	4.5	18.3	22.8	60
Above stack HT	SO ₂				
	1-HR	(3)			
	3-HR	(3)			
	24-HR	210.4	86.4	296.8	365
	Annual	12.9	18.3	31.2	60
Below stack HT	TSP				
	24-HR	4.7	143	147.7	150
	Annual	0.1	39.7	39.8	60
Above stack HT	TSP				
	24-HR	6.5	143	149.5	150
	Annual	0.4	39.7	40.1	60
Below stack HT	CO				
	1-HR	0.2	22.0	22.2	35
	8-HR	0.1	8.8	8.9	10
Above stack HT	CO				
	1-HR	(3)			
	8-HR	(3)			
Below stack HT	NO ₂				
	Annual	2.8	35.8	38.6	100
Above stack HT	NO ₂				
	Annual	8.0	35.8	43.8	100

Source: ERT, 1985a.

- All concentrations in $\mu\text{g}/\text{m}^3$ except CO which is in PPM.
- The most stringent of the Federal and Minnesota primary and secondary standards is listed.
- EPA has not established procedures for converting 24-hour concentrations from Valley into other averaging periods.

complete. The majority of the mobile source and fugitive particulate emissions are expected to be associated with earthmoving activities. Impacts from earthmoving and total construction activities will be relatively short-term and localized.

5.1.1.3 Hibbard Emissions Data

The Hibbard stack parameters for the operation of Units 3 and 4, are listed in Table 5.1-2. Stack parameters for loads of 100 percent, 90 percent, 75 percent and 50 percent were also used in the screening modeling. Loads of varying percentages were considered to determine worst-case conditions for the operation of Units 3 and 4. Impacts vary at different loads due to variations in dispersion parameters. The stack parameters for the 1978 baseline scenario are also listed in Table 5.1-2. The baseline parameters were determined through analysis of 1978 operating data from the Hibbard Station (ERT, 1985a).

The Hibbard Station is equipped with two short stacks (218 feet) and one tall stack (330 feet). During the 1978 baseline period, Units 3 and 4 vented their emissions to the two short stacks while Units 1 and 2 vented their combined emissions to the tall stack. Under the proposed action, Units 3 and 4 would be vented to the tall stack. The MPCA and EPA Region V have considered the applicability of the stack height regulation to the proposed project. Since emissions from Units 3 and 4 were previously vented to the shorter stacks, the retrofit of Units 3 and 4 is not allowed to take credit for the taller stack height. Hence, the stack height used to evaluate attainment with NAAQS and PSD increments was 66.45m. The analysis also includes modeling results for the actual 100.6 m stack height in order to assess actual impact conditions. The MPCA and EPA Region V have also agreed that the flue gas flow rate to be used in the modeling analysis for the proposed action should be the sum of the individual flue gas flow rates from each of the two units. Taking credit for the combined flue gas rates is not considered a "dispersion enhancement technique" under the current stack height regulation because the total allowable SO₂ emission rate for both Units 3 and 4 is less than 5000 tons per year¹.

5.1.1.4 Attainment of Ambient Standards

The results of the modeling analysis relative to attainment with ambient standards are summarized in Table 5.1-1. The results in Table 5.1-1 represent the worst case load condition producing the highest modeled concentrations. The numbers presented in the table represent different load conditions. The worst-case result is listed for each pollutant. For more detail, refer to the Air Quality technical report (ERT, 1985a). The results show that the total concentrations (highest modeled plus highest background) for all pollutants and averaging periods do not exceed ambient standards.

The analysis was also conducted using the actual tall stack height (100.6m). The results of this analysis are presented in Table 5.1-3. A comparison of Tables 5.1-1 and 5.1-3 shows that concentrations from the

¹"Stack Height Regulation", 40 CFR Part 51.

Table 5.1-2. Hibbard Station Parameters for the Proposed Action
(Units 3 and 4) and for 1978 Baseline Conditions

Stack height ^a = 66.45m						
Stack diameter = 4.27m						
	Emissions (lb/hr) ^b				Exit Temperature	Exit Velocity
<u>Load</u>	<u>SO₂</u>	<u>TSP</u>	<u>NO_x</u>	<u>CO</u>	<u>(°K)</u>	<u>(m/s)</u>
<u>Proposed Action</u>						
100%	916	28.10	570	452	436	14.3
90%	824	25.28	514	406	433	12.9
75%	688	21.08	428	340	430	10.6
50%	458	14.06	286	226	422	6.9
 <u>1978 Baseline</u>						
<u>Stack No.^c</u>	<u>SO₂ Emission Rate (lb/hr)</u>	<u>Stack Height (m)</u>	<u>Stack Diameter (m)</u>	<u>Exit Temperature (°K)</u>	<u>Exit Velocity (m/s)</u>	
1	444	100.58	4.27	432	3.26	
2	271	66.45	3.28	424	3.52	
3	358	66.45	3.28	426	4.58	

Source: ERT, 1985a.

- The modeling analysis also includes results for the full 100.6m stack in order to assess actual impact conditions.
- Emission rates based on fuel consisting of 60 percent wood, 40 percent coal and sludge; emissions reported are the total for both units.
- Stack 1 serves Units 1 and 2; stack 2 serves Unit 3; stack 3 serves Unit 4.

Table 5.1-3. Results of the Compliance Analysis - Hibbard Station
with Actual 100.6m Stack^a Worst Case Proposed
Action

Receptor Location	Pollutant	Model Concentration
Below stack top	SO ₂	
	1-HR	158.2
	3-HR	142.4
	24-HR	63.3
	Annual	3.4
Above stack top	SO ₂	
	1-HR	(b)
	3-HR	(b)
	24-HR	206.8
	Annual	11.2
Below stack top	TSP	
	24-HR	2.0
	Annual	0.1
Above stack top	TSP	
	24-HR	6.3
	Annual	0.3
Below stack top	CO	
	1-HR	6.79 x 10 ⁻²
	8-HR	4.76 x 10 ⁻²
Above stack top	CO	
	1-HR	(b)
	8-HR	(b)
Below stack top	NO ₂	
	Annual	2.1
Above stack top	NO ₂	
	Annual	7.0

Source: ERT, 1985a.

- All concentrations in $\mu\text{g}/\text{m}^3$ except CO which is in PPM.
- EPA has not established procedures for converting 24-hour concentrations from Valley into other averaging times.

taller stack would be less than concentrations from the shorter stacks, as would be expected.

5.1.1.5 Attainment of PSD Increments

The PSD modeling analysis showed that the maximum 3-hour and 24-hour SO₂ increment consumption by the plant were only 7.7 $\mu\text{g}/\text{m}^3$ (1.5 percent of the increment) and 3-4 $\mu\text{g}/\text{m}^3$ (3.7 percent of the increment), respectively. In view of these low, short-term predictions, it was concluded that the annual average SO₂ increment would not be threatened. An analysis of predicted concentrations at the Rainbow Lake Class I wilderness area demonstrated that increment consumption there would be less than zero.

5.1.1.6 Hibbard Fugitive Dust Impacts

The sources of fugitive dust at the Hibbard Station are expected to be from the coal hopper unloading facility, the woodchips unloading facility, and the ash handling system. At the coal hopper unloading facility, fugitive coal dust will be generated at the hopper, feeder, and transfer points. Potentially, splintering and dust caused by friction could occur at the wood chips unloading facility; however, because the wood chips are expected to have a moisture content of up to 50 percent, this is not expected to be significant. Fugitive dust could also be generated in the handling and transporting of fly ash.

5.1.1.7 Papermill Impacts

For the proposed papermill, all steam provided for the generation of electricity and for the papermaking process will be generated off-site at the Hibbard Station. Hence, there will be no major sources of regulated pollutants at the mill and therefore, no significant air quality impacts associated with its operation. Two potential sources of fugitive dust emissions have been identified by the applicant: the de-barking and pulping processes and the clay unloading process. Fugitive dust emissions associated with these processes are not expected to be significant.

5.1.1.8 Conclusion

Based on a conservative screening modeling approach, the predicted air quality concentrations from the proposed action scenario will be less than the applicable ambient standards and SO₂ PSD increments. This scenario should not result in an adverse effect on air quality in the Duluth area.

5.1.2 Mitigation of the Proposed Action

The retrofit of the Hibbard Station and the operation of the papermill will be designed to comply with all federal, state and local air quality regulations imposing air pollution control requirements. Alternative air pollution control technologies for the power plant were evaluated on the basis of technical feasibility, performance, reliability, maintenance requirements, utility consumption, economic penalties and environmental impacts. The proposed control equipment and techniques were selected because they were

considered the most technically reliable and cost-effective means of reducing pollutant emissions. The different aspects of the control measures are discussed below.

5.1.2.1 Construction

Applicable measures such as those listed in Table 5.1-4, can be employed to mitigate the effect of fugitive dust emissions during construction. Implementation of these measures should result in no significant air quality impacts due to construction.

5.1.2.2 Hibbard Combustion System

The proposed action scenario calls for the burning of a 60 percent wood and 40 percent coal/sludge mixture in Units 3 and 4. The coal is proposed to be sub-bituminous with a 0.9 percent sulfur content. The SO₂ emissions from combustion are reduced by the burning of wood because wood has a lower sulfur content than coal.

To control particulates, the proposed action calls for installation of dual electrostatic precipitators (ESP) (one per unit) on the roof of the existing boilers. Mechanical collectors will be located upstream of the ESPs to minimize the amount of unburned carbon that must be handled. Each ESP will have a collection efficiency of 99 percent.

5.1.2.3 Control of Fugitive Dust at Hibbard Station

The sources of fugitive dust at Hibbard Station are expected to be coal handling, woodchip handling and ash handling. A dust collection system will be provided at the existing coal hopper unloading facility to control fugitive coal dust during unloading. The system will be designed to control dust at the hopper, feeder and transfer points. A dust collection system will also be provided for the tripper room to control fugitive dust while filling the bunkers and to continuously ventilate the bunkers for methane gas. Pick up points for the system will be located at the bunkers and the transfer point to the tripper conveyor. All coal dust collection and ventilation systems will be designed to meet the Lowest Achievable Emission Rate (LAER).

The wood chips used at the Hibbard Station are expected to have a moisture content of up to 50 percent, so that splintering and dust generation from friction are not expected to be significant. Nevertheless, the applicant plans to install dust control equipment.

A new dry pneumatic ash handling system has been included for the modification work at the Hibbard Station. The system will use the existing Unit 1 unused coal bunker for ash storage. The ash will be pneumatically conveyed from the siftings and front-end ash hoppers under the traveling grate and the new particulate removal system (electrostatic precipitator). The ash will then be conveyed to receiving equipment located on the bunker room roof of Unit 1 and deposited in the bunker. The ash will be temporarily stored in this sealed dust-tight bunker. To assist in unloading, diffusing stones will be added to the bunker. An air slide conveying system will transport

Table 5.1-4. Control Techniques for Fugitive Dust Sources During Construction

Source	Practicality of Regulation ^a	Control Method	Control Efficiency
Unpaved roads	2-3	Paving and right-of-way improvement	85%
	4	Surface treatment with penetration chemicals	50%
	3	Soil stabilization chemicals worked into the roadbed	50%
	1-2	Speed control	25 mph-25% 20 mph-35% 15 mph-40%
Construction activity	1-2	Watering	50%
	2	Chemical stabilization of completed cuts and fills	80%
	3	Treatment of temporary access and haul roads on or adjacent to site	50%
Trailing pile	2	Chemical stabilization	80%
	2-3	Vegetation	65%
	2	Combined chemical-vegetative stabilization	90%
Aggregate	2	Continuous spray of chemical on material going to storage piles	90%
	1-2	Watering of haul roads and storage areas	50%
	3	Treatment of haul roads and traffic areas	50%
	2	Watering (sprinklers or truck)	80%

Source: PEPCO, 1973.

a. 1 - Excellent; 2 = Good; 3 = Fair; 4 = Poor.

the ash from the outlet of the bunker to a telescopic spout. The ash will be loaded in enclosed tank-trucks and transported off the site for disposal. As estimated 7600 tons a year of ash will be produced. These procedures for controlling fugitive dust emissions should cause these emissions to be insignificant.

5.1.2.4 Papermill

There will be no point sources at the proposed papermill that will have a significant emission of pollutants. The dry clay unloading process is expected to be a potential source of fugitive dust emissions. Specific design information regarding the control device is not yet available. No significant fugitive emissions of wood dust from the de-barking and pulping processes are expected because the wood will be wet.

5.1.3 Impacts of the Fully Permitted Action

The fully permitted action represents the operation of the Hibbard Station at 100 percent load with Units 3 and 4 burning the coal/wood/sludge mixture and Units 1 and 2 are burning #2 distillate fuel oil with 0.23 percent sulfur content and an ash content of less than 0.02 percent. It also includes the operation of the papermill. Since the operation of the papermill is unchanged from the proposed action, its air quality impacts would be the same as discussed in 5.1.1.

5.1.3.1 Hibbard Emissions Data

The Hibbard parameters for the fully permitted action scenario are listed in Table 5.1-5. Stack parameters for loads of 90 percent, 75 percent and 50 percent were also used in the screening modeling. Different loading scenarios were used because worst-case air impacts are not always associated with 100 percent load conditions. Table 5.1-6 shows worst-case results. The stack parameters for 1978 baseline conditions presented in Table 5.1-2 were also used in the PSD analysis for the fully permitted action.

As discussed above, Units 3 and 4 cannot take credit for the tall stack height because of the stack height regulation. Since Units 1 and 2 were vented through the tall stack during the 1978 baseline period, MPCA and EPA Region V will allow the applicant to take full credit for the tall stack height for these units. Consequently, for the NAAQS and PSD compliance analysis, Units 3 and 4 were modeled at the short stack height (66.45 m) and Units 1 and 2 were modeled at the tall stack height (100.6 m). The analysis includes modeling results for the four units ducted into the 100.6 m stack in order to assess actual impact conditions.

5.1.3.2 Attainment of Ambient Standards

The results of the modeling analysis relative to attainment or ambient standards are summarized in Table 5.1-6. The results show that the total concentrations (highest modeled plus highest background) for all pollutants and averaging periods are below the ambient standards.

Table 5.1-5. Hibbard Station Parameters for the Fully Permitted Action (Units 1 through 4) at 100 Percent Load and at Lower Load Conditions

Units 3 and 4 Stack Height^a = 66.4m
 Units 1 and 2 Stack Height = 100.6m
 Stack Diameter = 4.27m

Velocity Load	Emissions (lb/hr) ^b								Exit Temperature	Exit
	Units 3 and 4				Units 1 and 2				(°K)	(m/s)
	SO ₂	TSP	NO _x	CO	SO ₂	TSP	NO _x	CO		
100%	916	28.10	570	452	243	10.44	499	37.23	463	26.7
90%	824	25.28	514	406	219	9.40	449	33.51	460	24.1
75%	688	21.08	428	340	182	7.83	374	27.92	454	20.0
50%	458	14.06	286	226	122	5.22	249	18.62	440	13.2

Source: ERT, 1985a.

- The modeling analysis also includes results for all 4 units ducted into the 100.6m stack in order to assess actual impact conditions.
- Emission rates for Units 1 and 2 based on combustion of #2 distillate fuel oil; emission rates for Units 3 and 4 based on fuel consisting of 60 percent wood, 40 percent coal and sludge. Emissions reported are the total for each set of 2 units.

Table 5.1-6. Results of the NAAQS Compliance Analysis for the Hibbard Station with One-100.6m Stack and Two-66.4m Stacks^a Fully Permitted Action Worst Case

Receptor Location	Pollutant	Model Concentration	Background	Total Concentration	Ambient Standard ^b
Below stack top	SO ₂				
	1-HR	118.3	235.7	354.0	1300
	3-HR	106.5	151.9	258.4	915
	24-HR	47.3	86.4	133.7	365
	Annual	2.5	18.3	20.8	60
Above stack top	SO ₂				
	1-HR	(c)			
	3-HR	(c)			
	24-HR	212.6	86.4	299.0	365
	Annual	10.8	18.3	29.1	60
Below stack top	TSP				
	24-HR	1.6	143	144.6	150
	Annual	0.1	39.7	39.8	60
Above stack top	TSP				
	24-HR	6.5	143	149.5	150
	Annual	0.4	39.7	40.1	60
Below stack top	CO				
	1-HR	4.30×10^{-2}	22.0	22.4	35
	8-HR	3.04×10^{-2}	8.8	8.8	9
Above stack top	CO				
	1-HR	(c)			
	8-HR	(c)			
Below stack top	NO ₂				
	Annual	2.3	35.8	38.1	100
Above stack top	NO ₂				
	Annual	10.0	35.8	45.8	100

Source: ERT, 1985a.

- All concentrations in $\mu\text{g}/\text{m}^3$ except CO which is in PPM.
- The most stringent of the Federal and Minnesota primary and secondary standards is listed.
- EPA has not established procedures for converting 24-hour concentrations from Valley into other averaging times.

Table 5.1-7. Results of the Analysis for the Hibbard Station with Actual 100.6m Stack^a Fully Permitted Action Worst Case

Receptor Location	Pollutant	Model Concentration
Below stack top	SO ₂	
	1-HR	121.1
	3-HR	109.0
	24-HR	48.4
	Annual	2.2
Above stack top	SO ₂	
	1-HR	(b)
	3-HR	(b)
	24-HR	164.9
	Annual	8.9
Below stack top	TSP	
	24-HR	1.61
	Annual	0.07
Above stack top	TSP	
	24-HR	5.1
	Annual	0.3
Below stack top	CO	
	1-HR	4.45 x 10 ⁻²
	8-HR	3.11 x 10 ⁻²
Above stack top	CO	
	1-HR	(b)
	8-HR	(b)
Below stack top	NO ₂	
	Annual	2.0
Above stack top	NO ₂	
	Annual	8.2

Source: ERT, 1985a.

- a. All concentrations in eg/m^3 except CO which is in PPM.
- b. EPA has not established procedures for converting 24-hour concentrations from Valley into other averaging times.

The results of the analysis for the actual future stack configuration are presented in Table 5.1-7. A comparison of Tables 5.1-6 and 5.1-7 shows that lower concentrations are predicted for the 3-stack case. This occurred because for this configuration, the maximum concentrations from each stack do not occur at the same place and therefore are not additive.

5.1.3.3 Attainment of PSD Increments

The PSD modeling analysis showed that for receptors below stack top, the maximum 3-hour and 24-hour increment consumption by the station were only $1.0 \mu\text{g}/\text{m}^3$ (0.2 percent of the 3-hour increment) and $0.4 \mu\text{g}/\text{m}^3$ (0.4 percent of the 24-hour increment), respectively. For receptors above stack top, the maximum 24-hour increment consumption was $4.3 \mu\text{g}/\text{m}^3$ (5 percent of the increment). In view of these low, short-term predictions, it was concluded that the annual-average SO_2 increment would not be threatened. An analysis of predicted concentrations at the rainbow lake Class I wilderness area demonstrated that increment consumption there would be less than zero.

5.1.3.4 Hibbard Fugitive Dust Impacts

Because the fully permitted action does not call for the addition of combustible material that may produce dust, the impacts from fugitive dust would not be different than for the proposed action.

5.1.3.5 Conclusion

Based on a conservative screening modeling approach, the predicted air quality concentrations expected from the fully permitted action are less than the applicable ambient standards and SO_2 PSD increments. This scenario should not result in an adverse effect on air quality in the Duluth area.

5.1.4 Mitigation of the Fully Permitted Action

Mitigation measures applicable to the fully permitted action are the same as for the proposed action. As previously discussed, the fully permitted action includes the operation of all Hibbard Units at 100 percent capacity. The sulfur content of the fuel oil will be only 0.23 percent for this scenario. SO_2 emissions are also lowered by the use of the coal/wood chips/sludge mixture in Units 3 and 4.

Particulate emissions from Hibbard Station will be controlled by the ESPs that were described in 5.1.2.2. Since Units 1 and 2 will burn fuel oil, there will be no additional fugitive dust mitigation measures required for the fully permitted action.

5.1.5 Proposed Acid Deposition Standard

In 1982, the Minnesota Legislature directed the MPCA to adopt an acid deposition standard for sensitive areas in the state and a control plan to attain and maintain that standard. On November 15, 1985, MPCA proposed an acid deposition standard of 11 kilograms of wet sulfate per hectare per year

and a control plan that would restrict SO₂ emissions from certain Minnesota sources. The standard and control plan will become part of Minnesota law under Chapter 7005.

The MPCA has monitored wet deposition rates at several sites in Minnesota since 1980. The data show that the proposed standard is being met at all but one site (Sandstone), where the maximum annual wet deposition rate was 14.4 kg/hectare. Modeling demonstrated that Minnesota sources contributed less than 10 percent of this rate. Therefore, controlling Minnesota sources alone would not result in attainment of the standard at Sandstone.

The MPCA has proposed a plan to maintain the standard that includes the following provisions:

- o Place an upper limit or cap on the emissions from two Minnesota utilities:
 - Minnesota Power (MP) 39,000 TPY SO₂ by 1990
 - Northern States Power (NSP) 91,000 TPY SO₂ by 1990
- o Reduce Statewide SO₂ emissions 30,000 TPY from 1980 levels by 1990, and another 30,000 TPY by 1994.
- o Require reasonably available control technology (RACT) on certain utility plants.

The proposed standard does not impose any specific emission limitations on the Hibbard Station. Systemwide, Minnesota Power facilities emitted approximately 31,000 tons of SO₂ in 1984 (Bordson, 1985). Under the proposed action, the Hibbard Station could potentially emit, with both Units 3 and 4 operating continuously at maximum capacity, approximately 4000 TPY. However, the anticipated actual annual SO₂ emissions would be approximately 2400 TPY or less than 10 percent of total Minnesota Power emissions (Lindholm, 1985).

5.1.6 Trace Metal Analysis

Concentrations of trace metals due to the combustion of the wood/coal/sludge mixture at the Hibbard Station were analyzed (Fleischauer, 1985 and ERT, 1985a). The burning of #2 distillate fuel oil under the fully permitted action would not significantly add to the trace metal concentrations. Trace metals are primarily produced from the combustion of coal.

The emission rates of trace metals were calculated based on the same information used for the air quality analyses. Because the Hibbard Station will use sub-bituminous coal from sources throughout the United States, worst-case emissions for a range of sub-bituminous coal sources were used in the analysis.

Estimated trace metal emission rates for the four load conditions were calculated. Concentrations of the trace metals were estimated by taking the ratio of a trace metal emission rate over the SO₂ emission rate for a given load scenario, and multiplying that ratio by the appropriate SO₂

concentration. The resulting concentrations are listed in the Air Quality technical report (ERT, 1985a). The concentrations for all 23 trace metals are insignificant for all load scenarios.

5.1.7 Fogging and Icing

The potential for induced fogging and icing effects which could occur from the project was analyzed (ERT, 1985a). The analysis was performed using the cooling Tower Model (CTM). The model simulates the discharge, transport, and dispersion of water vapor emitted from a source and predicts the occurrence of fogging or icing. Worst-case screening meteorology was used in the analysis. The fogging and icing analysis was done for the Hibbard Station tall stack for the proposed action and fully permitted action scenarios, including the mill primary clarifier.

Receptor distances to the Bong Bridge and Interstate 35 (I-35) were determined for the Hibbard stack and papermill. A background relative humidity of 80 percent and ambient temperatures of 0°F and 60°F were used as input.

5.1.7.1 Hibbard Station

The results of the analysis show that no fogging or icing would occur on the Bong Bridge or I-35 for the proposed action or fully permitted action scenarios. The plume rise is high enough so that the water vapor does not come into contact with the bridge or I-35 in sufficient concentrations to cause fogging and icing (ERT, 1985a).

5.1.7.2 Papermill

Results of the analysis show that for low wind speeds and stable atmospheric conditions, fogging and icing may occur. These conditions typically occur on clear, cold nights, but under these conditions, a relative humidity of 80 percent does not usually occur. Interstate 35 runs west to north in relation to the primary clarifier. Thus, winds from the east through south would cause the vapor plume from the primary clarifier to pass over I-35. Wind roses for the nearby Minnesota Point Coast Guard Station show that the frequency of occurrence for these winds is less than 5 percent. The winter wind rose in particular, shows an extremely low frequency of these winds.

The screening analysis was extremely conservative. A refined analysis using hourly meteorology and estimated evaporation rates of water from the primary clarifier will be done for the final EIS.

5.1.8 No Action Alternative

Under the no action alternative, no modifications would be made to the Hibbard Station and the papermill would not be constructed and operated. The atmospheric loading of SO₂ and other pollutant emissions would not be increased. Although the Hibbard Station would remain idle, air permits that would allow the plant to operate should demand for power ever warrant, would remain in effect.

5.1.9 Odor

Various potential sources of odor are anticipated from project operation. These include primarily the pulping and wastewater processes. These sources and their effects are described in this section.

5.1.9.1 Impacts of the Proposed Action

No objectional odor impacts from the proposed action and the operation of Hibbard Units 3 and 4 at 50 percent capacity are expected. There is a small possibility that some odors may be emitted from the sludge removed from the process wastewater treatment system, but these odors are not expected to be noticeable offsite unless prolonged anaerobic conditions develop in the primary clarifier.

Unlike traditional kraft papermills which usually emit noxious odors, the proposed plant will have a closed loop groundwood bleaching system which will not generate noxious odors. The main sources of odorant substances at the papermill will be from the pulping process and the process wastewater system. The pulping process is expected to generate "woody" odors. In this process the digesting of wood chips under pressure with steam frees some organic compounds from the wood fiber. These compounds include a group called terpenes. The terpenes are hydrated in the process to become terpene alcohols which have distinctive odors. Although these compounds do have a distinctive odor, they are not generally regarded as offensive.

Potential objectional odor impacts in the Duluth area are primarily from the Western Lake Superior Sanitary District (WLSSD) treatment plant. The odor excursions are a function of the ambient temperature and wind direction on any given day, and tend to be intermittent. The WLSSD has confirmed that the treatment facility will be able to readily handle the increased effluent loading from the papermill (ERT, 1985a).

The clarifier at the mill will remove 80 percent of the solids from the plant effluent. This will decrease the potential for anaerobic, odor-inducing conditions at the WLSSD treatment plant. Bottom sludge at 2 percent solids will be pumped continuously from the clarifier so that the wastewater will not become septic. During this pumping, the potential for odor excursions may occur. The water discharged from the clarifier to the WLSSD sewer system will not be held long enough to become septic; thus avoiding the potential for odorous emissions at the Oneota Street sewage pumping station (WLSSD #12).

The proposed action calls for the retrofit of Hibbard Units 3 and 4 to burn both wood and coal. There should be no odors associated with combustion of these two fuels. The coal and wood will be stored separately in fuel bunkers or storage silos at the Hibbard Station. These will contain any odors associated with wood decay. Sludge and woodbark from the proposed papermill will be transported to the Hibbard Station in trucks for immediate incineration. Therefore, there will be no significant odors associated with their transport.

5.1.9.2 Impacts of the Fully Permitted Action

Under the fully permitted action, Hibbard Units 1-4 would operate at full capacity with Units 1 and 2 burning number two distillate fuel oil and Units 3 and 4 burning wood and coal. There would not be any odors associated with this level of operation at the Hibbard Station. There are no mitigative measures which apply to the fully permitted action that do not also apply to the proposed action.

5.1.9.3 Mitigation

Complete enclosure of the papermill pulping process will act as a mitigative measure to contain odors. Treatment of the process sludge with lime and ferric chloride is expected to eliminate potential sludge odors. The wastewater clarifier, which will remove 80 percent of the solids, also represents mitigation of potential impacts to the WLSSD treatment plant. Similarly, incineration of the sludge will remove waste that would otherwise become part of the WLSSD waste stream. Transport of this sludge will be in covered trucks. The proposer does not intend to cover or otherwise enclose the mill primary clarifier. However, a permanent cover or enclosure for this part of the pretreatment system would contain odors should they develop and would also control the release of water vapor which would potentially cause fogging and icing conditions on I-35 as discussed in 5.1.7.

5.1.9.4 No Action Alternative

Without the proposed papermill, the present odor conditions near the site would continue. No new odor potentials would occur.

5.1 References

Bordson, D., 1985. Personal Communication between Bordson, Minnesota Pollution Control Agency and Environmental Research & Technology, Inc., about acid depositions, _____.

Environmental Protection Agency, 1977a. Valley Model User's Guide, EPA Publication No. EPA-450/2-77-018, U.S. Environmental Protection Agency, Research Triangle Park, NC.

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Environmental Protection Agency, 1979. Industrial Source Complex (ISC) Dispersion Model User's Guide, Volume I, EPA Publication No. EPA-450/4-79-030, U.S. Environmental Protection Agency, Research Triangle Park, NC.

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PEPCO - Environmental Specialists, Inc., 1973. Investigation of Fugitive Dust - Sources, Emissions and Control, PB-226 693, prepared for U.S. Environmental Protection Agency by PEPCO - Environmental Specialists, Inc., Cincinnati, OH.

"Stack Height Regulation", 40 CFR Part 51.

5.2 SURFACE WATER

Potential impacts of the associated with hydrology, water quality, water supply, and wastewater collection and treatment are discussed below. The impact assessment considers the proposed action, the fully permitted action, and the no action alternative.

5.2.1 Impacts of the Proposed Action

The proposed project is expected to have minimal impacts upon study area water quality and hydrology. However, three topics of potential impacts have been identified: site stormwater runoff; withdrawal of water from St. Louis Bay via the Hibbard Station intake structure; and incremental effects of the WLSSD wastewater discharge to St. Louis Bay due to the additional waste discharges from the papermill.

5.2.1.1 Hydrology

Development of the papermill will affect the amount of impervious area on the 92-acre parcel. Detailed site plans have yet to be developed, and thus the hydrologic regime of the site after development is not known precisely. Initial estimates are that the total impervious area will increase. Approximately 15 acres out of 92 now represent impervious area; approximately 27 acres will be impervious after site development. Approximately 5 acres of the site now characterized as wooded will be cleared, but the final site will include approximately 25 acres of landscaped area (ERT, 1985).

Engineering design work has not yet progressed to the point of drainage system design. Conceptual plans have been completed showing general site grading and drainage as described in Chapter 3. The portions of the site east of and including the paper machine, the area east of 52nd Avenue, will be drained to St. Louis Bay. This area includes the log storage piles and manufacturing areas on the site. The remaining portion of the site will drain to Keene Creek. The site area draining to Keene Creek will be primarily the landscaped entrance area. The administrative building and front parking lot are the only intensively developed areas that will be drained to Keene Creek.

Development of the site will include construction of a new drainage and storm sewer system. Most or all of existing storm sewers will be removed and replaced by the new system. The new system will be designed in accordance with local requirements and standard drainage practice to ensure the adequacy of the sewers and other drainage structures. An integral part of the site development will be the construction of adequate stormwater collection and control systems.

Development of the site is expected to improve stormwater quality draining from the site into Keene Creek and St. Louis Bay. Water quality analyses of onsite surface water and Keene Creek (Table 4.2-1) indicate existing water quality problems that may be associated with runoff from the site. Areas within the site, previously used for a scrapyard and a junkyard, are abandoned or have past or present uses detrimental to stormwater quality. Cleanup of the site and construction of a modern facility are expected to

significantly improve stormwater and nonpoint source water controls. These onsite improvements will tend to improve water quality in Keene Creek.

Stormwater quality and flow impacts are often most severe during site construction. Cleared land and unstabilized soil yield greater runoff volumes and suspended sediment loss than landscaped or undisturbed land.

As discussed in Section 4.2.1, Chapter 51 of the Duluth City Code defines several flood zone districts and places restrictions on construction and activities in the various districts. The floodway district is technically determined as the part of the 100-year floodplain in which filling or other floodplain encroachment would cause a rise in the 100-year flood elevation by more than 1 foot. In compliance with the Duluth City Code, there will be no filling, construction or facility operations in the floodway district as a result of the proposed facility. Existing grades along the banks of Keene Creek will be maintained and no construction will alter the creek or its alignment. The flood fringe district corresponds to the remainder of the 100-year floodplain. Generally, the Duluth City Code requires that structures in the flood fringe district be placed on fill above the elevation of the 100-year floodplain and must be floodproofed. There will be limited construction in the flood fringe zone. The southern end of the manufacturing (paper machine) building will extend into the flood fringe zone, as will its appurtenant paved loading area. The southern half of the log storage area will also be in the flood fringe district. Proposed fill activities are described in Section 5.2.3.1.

5.2.1.2 Surface Water Withdrawals

The proposed action includes the resumed operation of the Hibbard Station as well as resumption of surface water withdrawals via the existing Hibbard Station cooling water intake. However, rather than flowing into the Hibbard cooling water system, the withdrawn water will flow through an 18-inch diameter pipe to the papermill. Flow will be driven by a new suction pump located at the intake house; the large capacity circulating water pumps of the Hibbard Station will not be used.

Under the proposed action, the Hibbard Station will appropriate 4 mgd of water for papermill processes. The effects of the 4 mgd withdrawal on entrainment and impingement are discussed in Section 5.8. The hydrologic impacts of the water withdrawal will be minimal. A consumptive use rate of 4 mgd is equivalent to 6 cubic feet per second (cfs). This is considerably less than the St. Louis flow rate above Fond du Lac Dam of 2313 cfs, the once-in-ten years seven-consecutive-day low-flow (7Q10) of 348 cfs, or even the historical observed low flow of 54 cfs (ERT, 1985).

5.2.1.3 Thermal Discharge

Cooling water discharges from the Hibbard Station will not be required under the proposed action. Thus, thermal impacts to St. Louis Bay are not anticipated.

5.2.1.4 Water Supply

The principal structure associated with the water supply is a 1.5 million-gallon water storage tank to be used for storage and fire reserve. Water will be pumped to the storage tank from the intake structure at the Hibbard Station. Process water will flow by gravity from the storage tank to a package water treatment system consisting of a high rate adsorption clarifier, mixed media filtration, and chemical feed systems. The average daily withdrawal of water from the river will be between 3.5 and 4.0 mgd. The peak water usage will be 4.9 mgd.

Water from the municipal system will be used for plant sanitary uses as well as boiler makeup water. The City of Duluth's system has adequate capacity in the local mains to provide up to 400 gpm to the plant for the makeup system and plant potable water needs. The projected demand is approximately 210 gpm. Several of the existing water lines on the site will be used to supply water to the papermill. In addition, a few of the small distribution lines will be abandoned and sections of a 10-inch main will be installed from Central Avenue to the plant and along the eastern border of the site.

Water supply impacts from the project are expected to be minimal. The proposed maximum withdrawal rate from the St. Louis River is significantly less than the 236 mgd currently permitted for the Hibbard Station. Also, the Duluth water supply system has adequate capacity to meet the municipal water needs of the project.

5.2.1.5 Wastewater Collection and Treatment

The existing sewer lines that currently service the site will be modified to convey process and sanitary wastewaters from the papermill and the Hibbard Station. The papermill operations will produce approximately 3.0 mgd of process wastewater. The wastewater will be collected in various process areas and pretreated prior to discharge to the WLSSD sewer. The treated wastewater will flow by gravity to the WLSSD sewer along the east side of the site. Table 3.4-2 in Chapter 3 is a summary of the expected characteristics of the pretreated wastewater prior to discharge to the WLSSD sewer.

The discharges to WLSSD should not appreciably contribute to the existing odor problems that the WLSSD sewer and treatment plant have experienced (Section 5.1.2).

The proposed discharge to the WLSSD Advanced Treatment Facility represents an increase in the average flow, BOD5 and TSS loadings to the facility above current levels. The loadings, however, are still well below the original design capacities of the treatment plant. The original 1990 design projections for flow and BOD/TSS loading are not currently valid. Municipal growth projections have been much lower than originally thought, while industrial loadings have reduced with time due to plant closings and pretreatment implementation. Therefore, the excess capacity that currently exists is expected to continue well past 1990, and thus it is very unlikely that the proposed discharge will adversely affect the WLSSD facility.

With the flow and loading from the papermill, the WLSSD facility will still operate at an average flow of 85 percent of design, and treat 72 percent of

the design BOD5 and 52 percent of the design TSS. Tables 5.2-1 and 5.2-2 present a mass balance for the WLSSD facility for BOD5 and TSS removal with and without the discharge from the proposed papermill. The plant mass balances were conducted using the April, 1985 plant operations data because this month represents the highest average monthly flow and BOD5/TSS loadings for 1985. The calculations show that the effluent concentrations of BOD5 could increase from 8 to 11 mg/L while TSS concentrations could increase from 10 to 11 mg/L. The BOD5 loading to the receiving stream could increase from 2740 to 3742 lbs/day, still within the permitted limit of 9097 lbs/day. The TSS loading to the St. Louis River could increase from 3282 to 3939 lbs/day, which is also within the permitted level of 10,916 lbs/day.

Sludge production at the WLSSD could be expected to increase from 37,500 to 44,700 lbs/day of dry solids. The adjacent resource recovery facility has adequate capacity to accommodate this increase in sludge from the treatment plant.

The project will not contribute significant quantities of nonconventional or toxic pollutants that could ordinarily affect either treatment plant performance, sludge toxicity, or effluent characteristics (i.e., pass through). Process wastewaters will not contain any toxic constituents. Trace levels of metal ions will be discharged as a result of the production of steam at the Hibbard Station. These discharges are small and most certainly will be diluted to nondetectable levels by the time they reach the WLSSD facility (ERT, 1985).

The proposed discharge from the papermill will produce a nutrient demand at the WLSSD facility that will likely increase the usage of ammonia and phosphorus in the plant influent as nutrients for the biological degradation of BOD. While this will not significantly alter the effluent concentration of total phosphorus in the WLSSD effluent (currently 0.9 mg/L vs. permit limit of 1.0 mg/L), it does mean that amenable phosphorus will be available for microorganism growth.

The proposed papermill discharge to the WLSSD treatment plant will conform with the effluent limitations guidelines promulgated by the U.S. EPA for the "Pulp, Paper and Paperboard Point Source Category" (40 CFR Part 430). The New Source Performance Standards (NSPS) limit the discharges of pentachlorophenol and trichlorophenol when these biocides are used. Likewise, zinc discharges are limited in facilities where zinc hydrosulfite is used as a bleaching agent. Since those substances will not be used in the operations of the project, the mill must certify this to the WLSSD prior to issuance of an industrial users permit.

5.2.2 Impacts of the Fully Permitted Action

The operation of Hibbard Station Units 1-4 at full capacity for electric power generation will require the withdrawal and discharge of circulating cooling water. Hydrologic impacts associated with site drainage and flooding for the fully permitted action are the same as for the proposed action.

Table 5.2-1. Current Conditions at WLSSD Treatment Facility^a

Characteristics	Flow	BOD5	TSS
Influent	39.39 mgd	44,000 lb/d	40,100 lb/d
Activated sludge effluent	39.17 mgd	6600 lb/d	15,900 lb/d
Flocculator/clarifier effluent	39.14 mgd	5080 lb/d	11,720 lb/d
Mixed media filter (final) effluent	39.14 mgd	2740 lb/d (8.4 mg/L)	3282 lb/d (10.0 mg/L)
Permit limits	43.63 mgd (Design Flow)	9097 lb/d (25 mg/L)	10,916 lb/d (30 mg/L)
Sludge production	37,500 lb/d dry solids		

a. Based on Mass Balance Calculations for flow, BOD5, and TSS using April, 1985, operating conditions.

Table 5.2-2. Projected Conditions at WLSSD Treatment Facility^a

Characteristics	Flow	BOD5	TSS
Influent	42.39 mgd	60,000 lb/d	42,900 lb/d
Activated sludge Effluent	42.13 mgd	9000 lb/d	18,990 lb/d
Flocculator/clarifier effluent	42.10 mgd	6930 lb/d	14,070 lb/d
Mixed media filter (final) effluent	42.10 mgd	3742 lb/d (10.7 mg/L)	3939 lb/d (11.2 mg/L)
Permit limits	43.63 mgd (Design Flow)	9097 lb/d (25 mg/L)	10,916 lb/d (30 mg/L)
Sludge production	44,700 lb/d dry solids		

a. Based on Mass Balance Calculations for flow, BOD5, and TSS using April, 1985, operating conditions.

5.2.2.1 Surface Water Withdrawal

At the fully permitted level, water would be withdrawn from St. Louis Bay via the existing Hibbard Station intake structure at the rate of 181.8 mgd. Of this withdrawal, 4 mgd would be used by the proposed papermill and 177.8 mgd would be used as once-through cooling water for Units 1, 2 and 3 of Hibbard Station. Since the consumptive use rate of the fully permitted project is the same as the proposed project, 4 mgd (6 cfs), the hydrologic effects of the consumptive use will be the same.

The effect on entrainment of aquatic organisms due to the 181.8 mgd (281 cfs) withdrawal rate for the fully permitted project will be somewhat greater than the entrainment effects of the project. These effects are discussed in detail in Section 5.8.

5.2.2.2 Thermal Discharge

The fully permitted action alternative involves the discharge of heated open-cycle cooling water. The discharge flow rate and the increase in temperature over ambient (ΔT) of each unit for this alternative are presented in Table 5.8-5. The characteristics of the thermal plume for the fully permitted condition were determined for two cases:

- o Typical summer conditions represented by average conditions during July
- o Worst case (lowest heat transfer) conditions expected to occur during October.

The thermal plumes for these cases are shown on Figures 5.8-1 and 5.8-2, respectively. As shown, varying thermal plumes will result with temperature increases of up to 7°C above ambient conditions. The effects on aquatic organisms are discussed in Section 5.8. These results were obtained from thermal plume information previously presented in "Surface Thermal Profiles for Minnesota Power & Light Company - M.L. Hibbard and Aurora Steam Electric Stations." The plume information presented in that publication were determined assuming full power operation for all four units. Since the fully permitted alternative for this project does not involve a thermal discharge for Unit 4, a somewhat reduced thermal load will result. Therefore, the predictions shown on Figures 5.8-1 and 5.8-2 were obtained by applying a simple ratio of the thermal loadings to the previously presented plume data.

5.2.2.3 Water Supply

The fully permitted action will also require additional raw water from the municipal supply for boiler feedwater associated with steam/electricity generation. Approximately 16,000 gallons per day (gpd) will be required to account for the water losses from steam generation such as boiler blowdown and evaporation. The Duluth Municipal system has adequate capacity both to convey and supply the fully permitted action with boiler water.

5.2.2.4 Wastewater Collection and Treatment

The fully permitted action will produce the identical quantities of process wastewaters from the papermill. The only additional flows of wastewater to be discharged to the WLSSD sewer will be approximately 32,000 gpd of boiler blowdown and demineralizer regenerate from the Hibbard Station. These streams would result from increased use of boilers in Units 1 and 2 to produce steam/electricity. The quantities and loads of metal ions and suspended solids are insignificant compared to the current WLSSD raw sewage flows.

5.2.3 Mitigation

Mitigation measures will be utilized to reduce the water-related impacts of the project. With these measures, hydrology, water supply, and wastewater collection and treatment impacts are expected to be minimal. The surface water withdrawal impacts identified for the proposed action are not in need of mitigation.

5.2.3.1 Hydrology

During the construction phase of the project, exposed acreage will be kept to a minimum to alleviate erosion and the subsequent sedimentation of Keene Creek and St. Louis Bay. This will be accomplished by mulching and reseeding soils as soon as it is feasible after their exposure. Any sediment runoff during construction will be controlled by the placement of berms (bales of hay as sediment traps), silt fences and/or diversions in appropriate site locations.

Landscaped buffer areas and any necessary stormwater controls will be created to protect the water quality of Keene Creek and St. Louis Bay and to prevent local flooding and drainage problems during the operational phase. The water quality of Keene Creek will be further protected by segregating manufacturing and wood storage operations to the St. Louis Bay drainage.

Approximately 12 to 15 feet of fill will be placed to construct papermill facilities, placing them above the 100-year flood elevation. These measures will put the proposed facility in compliance with Chapter 51 of the Duluth City Code and will not appreciably impair the passage of flood flows nor raise the 100-year flood stage by more than 1 foot (ERT, 1985). Mitigation measures for hydrology-related impacts of the fully permitted action are the same as those for the proposed action.

5.2.3.2 Surface Water Withdrawal

Mitigation measures need to be taken to reduce the impingement effects due to surface water withdrawal under the fully permitted operating level. The intake velocity calculated using the existing intake structure would be unacceptably high (4.46 fps), resulting in a significant potential for fish impingement (ERT, 1985). The mitigative measures that are required to reduce the intake velocity are discussed in Section 5.8. The increased withdrawals from St. Louis Bay would be within the appropriations of the existing Hibbard Station permit (235.9 mgd) issued by the Minnesota Department of Natural Resources.

5.2.3.3 Thermal Discharges

An NPDES permit was issued for Hibbard Station for cooling water and other discharges made during full power operation of all four existing boiler units. Since the fully permitted alternative does not involve a thermal discharge from Unit 4, a somewhat reduced thermal load would result. Even with the reduced thermal load, the impacts of thermal discharges may need to be reexamined prior to reissuance of an NPDES permit for this facility.

5.2.3.4 Water Supply

Several mitigative measures will be employed at both the papermill and the Hibbard Station to minimize water usage. Steam generation at the Hibbard Station will use municipal water that passes through a demineralizer treatment system. Maximum recycle of condensed steam will be performed, thus minimizing the requirements for new boiler makeup water. This involves segregating steam lines at the papermill to avoid contamination. If condensed steam water does become contaminated, it will be used in other mill operations such as the groundwood plant. Several water conservation measures will be practiced in the actual paper production process. Maximum reuse of white water from vacuum savealls will be used, while water will be recycled from each process in the groundwood, bleach plant and papermill to the appropriate previous process. This has the effect of minimizing the requirement for new process waters. Process water consumption is expected to be 4400 gallons per ton of paper shipped. This is an extremely low usage rate for the paper industry. Proposed modifications to the distribution system will mitigate any problems associated with use of municipal water (ERT, 1985). The mitigation measures discussed for the proposed action would be the same for the fully permitted action.

5.2.3.5 Wastewater Collection and Treatment

The WLSSD facility does have adequate capacity to receive the proposed flow and loadings of BOD5/TSS. The use of preliminary/primary treatment at the papermill will provide a good buffer that minimizes direct discharges of large loads of BOD5 or TSS due to mill upset. While the likelihood of this is minimal, the magnitude of such a discharge would be within the capability of the WLSSD to treat. Proposed changes in the collection system will mitigate any potential problems that could occur due to the large discharge of process wastewater. Collection, dewatering and incineration of primary clarifier solids will reduce the loading on the WLSSD, requiring less solids handling at the large municipal treatment plant. The wastewater collection and treatment impacts are not in need of additional mitigation for either action.

5.2.4 No Action Alternative

Impacts that are described below would occur if no action were to be taken on the proposed or fully permitted projects. The impacts addressed are associated with hydrology, surface water withdrawal, thermal discharge, water supply, and wastewater collection and treatment.

5.2.4.1 Hydrology

The existing site drains into both Keene Creek and the St. Louis River Bay. On the site is a junkyard (containing transformers, battery casings and other deleterious materials). There presently is no protection for either receiving water body against contaminated runoff. However, under the proposed action, the junkyard would be removed. Furthermore, the site currently contains unpaved roadways and sparsely vegetated areas which are more prone to erosion, and potentially lead to increased sedimentation of the creek and the bay. In the absence of the project action, no landscaping, grading, or new stormwater collection system will be introduced to the site.

5.2.4.2 Surface Water Withdrawal

Under the no action alternative, the intake structure will remain inoperational because there will be no water withdrawal. Therefore, there will be no threat of impingement or of entrainment to aquatic life in St. Louis Bay.

5.2.4.3 Thermal Discharge

No thermal changes in St. Louis Bay will be experienced if no action is taken. No thermal changes are anticipated under the project. It is only under the fully permitted operating level that thermal impacts are expected.

5.2.4.4 Water Supply

If the project is not undertaken, the minor impacts associated with withdrawal of process water from the St. Louis River would not occur. The proposed intake of process water constitutes only 2 percent of the daily permitted appropriation for the Hibbard Station; therefore, no action represents very little difference than the actual proposed project with respect to water withdrawal from St. Louis River. The project will utilize approximately 210 gpm of water from the municipal supply, an amount that represents 2 percent of the total daily gallons currently supplied by the Duluth Water Company. Thus, no action represents very little difference than the actual proposed project.

5.2.4.5 Wastewater Collection and Treatment

If the project is not undertaken, the large flow of wastewater and TSS/BOD5 will not be discharged to the WLSSD facility. This plant currently has excess capacity to accommodate the planned project, therefore, implementation of the no action alternative would mean that the WLSSD plant would continue to operate at less than capacity. This situation means that the treatment process occasionally does not perform optimally because there is not enough "food" to support the microbial activity in the secondary treatment unit process. No action would also mean that the sewer modifications would not be performed, and thus the construction impacts associated with this operation would not occur.

5.2 References

Environmental Research & Technology Inc., 1985. Duluth Paper Mill-Water Quality, PD864-803, prepared for PNTA-MPL, Concord, MA.

ERT, See Environmental Research & Technology.

"Pulp, Paper, and Paperboard Point Source Category", 40 CFR Part 430.

5.3 NOISE

Noise impact is judged according to: (1) the extent to which specific governmental laws or regulations are exceeded and (2) the estimated extent to which people will be adversely affected. The governmental standards that apply to project operation are those of the MPCA as set forth in Section 4.3.

The extent of noise impact on human receptors from the project is a function of several interrelated factors: the change in noise levels; the presence of existing nonproject noise sources; people's attitudes concerning the project (Stevens et al., 1955); the number of people exposed; and the type of human activity affected (sleep, recreation, conversation). Table 5.3-1 indicates people's perceptions to changes in noise levels.

Table 5.3-1. Human Perceptions of Changes in Noise Levels^a

Change (dBA)	Human Perception
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of the sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt et al., 1973.

- a. It is assumed that the noise levels under consideration, such as traffic noise levels, are of a typical (broad-band) character (as distinguished from pure-tone, laboratory tests).

5.3.1 Impacts of the Proposed Action

Potential noise impacts include both relatively short-term construction sources and long-term operational sources. Potential mitigation measures vary accordingly.

5.3.1.1 Construction Noise Levels and Impacts

The construction period is estimated to last about 24 months. During this period noise will vary according to the particular phase of construction, the type and amount of equipment used, the average noise level for the equipment, its location, and the nature of the terrain between the noise source and the receptor. Field measurements of construction site noise, including heavy truck traffic, were used to evaluate potential construction

noise (ERT, 1985). Construction noise levels have been determined based on the distance between the project site and noise sensitive receptor areas. These noise levels include attenuation due to atmospheric and topographic effects. The major source of construction-related noise will be the earth moving equipment used to prepare the site. Graders, bulldozers, tractors, backhoes, and dump trucks will also produce noise during construction. Predicted noise levels due to construction activity from the project are listed in Table 5.3-2.

Construction activities are anticipated to occur during normal daytime week-day hours. Predicted noise levels during construction were compared with monitored noise levels for maximum weekday, daytime noise. The comparison shows that no noise increase from construction measured at the L₅₀, or median sound level, would occur at receptor one. Short term peak noise levels measured at the L₁₀ level would increase by 1 dBA and would not be perceptible. The L_{eq} or average steady sound level would increase by 2 dBA and would be barely perceptible. Construction noise would be somewhat attenuated at receptor one by the depressed elevation of the playground. The comparison shows that no increases from construction measured at L₅₀, L₁₀ and L_{eq} levels are predicted to occur at receptors two (school) and three (apartment building).

Heavy duty trucks used in construction are also a source of noise. Construction truck traffic is expected to use Interstate 35 and Raleigh Street to Central Avenue to access the project site via Old Route 2 as described in Section 4.5.

It is assumed that a total of 1000 trucks per day would be required during the construction period over a 10 hour work day (ERT, 1985). During the peak hour, 150 trucks would be expected. Construction employee traffic is also a source of noise. During peak construction activity, a conservatively high estimate of 1600 employees are expected to be on the project site. These employees are also expected to use I-35 to Central Avenue to access the proposed site via Old Highway 2. The 1600 employee scenario was analyzed to consider worst case conditions. Of the 1600 employees, 25 percent are expected to arrive during the A.M. commuter peak hour (7:30-8:30) and 25 percent are expected to depart the site during the P.M. (3:30-4:30) commuter peak hour. The remaining employees will arrive or depart during the off peak hours. Assuming a conservative vehicle occupancy rate of 1.25 persons per vehicle, 320 vehicles are expected to arrive during the A.M. and P.M. peak hours, respectively. A U.S. Department of Transportation Federal Highway Administration (FHWA) traffic noise prediction model was used to predict noise level increases (FHWA, 1978).

These anticipated maximum additional peak vehicular (auto and truck) trips associated with peak project construction would increase noise levels (L_{eq}) by 4 dBA at receptor one, by 3 dBA at receptor two, and by 2 dBA at receptor three. The increase at receptor one would be perceptible in the morning and afternoon peak hours. The increases at receptors two and three would be barely perceptible.

Table 5.3-2. Predicted Construction Noise Levels (dBA)
Receptor/Distance from Site

	Receptor One - Irving Playground 1100 ft west of site			Receptor Two - School 2200 ft west of site			Receptor Three - Ramsey Manor 1100 ft north of site		
	L ₅₀	L ₁₀	L _{eq}	L ₅₀	L ₁₀	L _{eq}	L ₅₀	L ₁₀	L _{eq}
Construction only	41	54	53	37	50	49	41	54	53
Existing (measured) daytime noise	51	59	56	53	65	63	57	66	64
Predicted future noise levels	51	60	58	53	65	63	57	66	64
Change (+)	0	1	2	0	0	0	0	0	0
Construction traffic increase (+) (trucks and employees)	-	-	4	-	-	3	-	-	2
Net change (+)	-	-	6	-	-	3	-	-	2
Future noise levels with construction traffic	-	-	62	-	-	66	-	-	66

Source: ERT, 1985.

Adding the increases in noise levels due to truck and employee construction traffic to construction levels (L_{eq}) on site would result in the following increases above baseline conditions:

- Receptor one - 6 dBA (readily noticeable)
- Receptor two - 3 dBA (barely perceptible)
- Receptor three - 2 dBA (barely perceptible)

Construction noise levels at the Hibbard Station will generally occur inside the existing facility and should be less than construction noise levels at the papermill construction site. However, assuming the same construction noise levels at the station (76 dBA at 100 feet, L_{10}), there would be no additional increase in the noise levels at the three residential receptors. The absence of impacts is due to distance. The nearest receptor, the Ramsey Manor apartment building, is about 3000 feet from the station and noise levels during construction are estimated to be 46 dBA at that location. Construction noise levels at receptor one, approximately 3800 feet from the station, and receptor two, about 5000 feet away, would be even lower than 46 dBA.

5.3.1.2 Operational Noise Impacts

Experience with similar projects indicates that the major sources of outdoor noise would be the wood yard, machine building, building exhausts and intakes, compressors, vents, fans, and trucks. Noise levels from a papermill of similar size and type in Minnesota were used to predict operational noise levels at sensitive receptors (ERT, 1985). An annual background traffic growth rate of 1 percent per year (simple) as well as traffic projections were obtained from the Minnesota Department of Transportation and the City of Duluth Traffic Engineering Department (ERT, 1985).

For purposes of this analysis, it was assumed that the papermill and woodyard would operate 24 hours a day. The project would result in about 400 additional trips per day during operation (including 300 employee trips), plus 44 pulp, 45 wood and coal, 2 ash, and 8 paper truck trips per day, 5 days per week. This is estimated to result in a peak hourly pass by rate, under the most conservative assumption, of approximately 9 trucks and 250 employee/other trips. This operational traffic is factored into the calculation of values in Table 5.3-3.

Noise from the project would be most noticeable during the quietest or minimum noise times during the week, such as early mornings. The data in Table 5.3-3 show that normal operation of the proposed project would result in the following noise levels. At receptor one (playground), daytime operational noise levels would increase from 51 to 55 dBA at the L_{50} level. This increase of 4 dBA would be perceptible. An increase of 1 dBA from 59 to 60 dBA at the L_{10} level would be barely perceptible. Daytime operational noise levels for the proposed papermill are within MPCA standards for NAC-1 which are 60, 65 and 63 dBA for L_{50} , L_{10} and L_{eq} levels, respectively. In addition, project traffic would increase daytime L_{eq} levels by 2 dBA from 58 to 60 dBA. The total operational L_{eq} increase of 4 dBA would be barely noticeable. Nighttime operational noise levels at receptor one would increase by 8, 6 and 6 dBA at the L_{50} , L_{10} and L_{eq} levels, respectively.

Table 5.3-3. Comparison of Baseline and Predicted Operational Noise Levels (dBA)

Noise Level Condition	Receptor One (Irving Playground)			Receptor Two (School)			Receptor Three (Ramsey Manor Apts.)		
	L ₅₀	L ₁₀	L _{eq}	L ₅₀	L ₁₀	L _{eq}	L ₅₀	L ₁₀	L _{eq}
Baseline ^b									
Day	51	59	56	53	65	63	57	66 ^a	64 ^a
Night	43	47	45	50	47	49	48	53	51
Future ^c (project operation):									
Project only									
Day ^d	52	54	52	50	52	50	52	54	52
Night ^d	50	51	50	48	51	48	50	51	50
Day increase (+)	55 4	60 1	58 2	55 2	65 0	63 0	58 1	66 ^a 0	64 ^a 0
Night increase (+)	51 ^a 8	53 ^a 6	51 6	52 ^a 2	53 6	52 3	52 ^a 4	55 2	54 ^a 3
Project traffic ^e increase (+)	-	-	2	-	-	2 ^a	-	-	1 ^a
Total operational noise with project traffic (added to day only)	-	-	61	-	-	65	-	-	65

Source: ERT, 1985.

a. Exceeds MPCA noise standards.

b. Based upon noise measurements.

c. Operational noise levels include effect of project, project traffic, plus baseline noise.

d. Project noise only.

e. Includes employee and truck trips.

This would result in noise levels of 51, 53 and 51 dBA respectively. These increases would be noticeable; however, only the L₅₀ MPCA nighttime standard for NAC-1 (50 dBA) would be exceeded and, in that case, by 1 dBA. A noise level not more than 2 dBA above the standard is considered to be within the standards. L₁₀ and L_{eq} nighttime noise levels would be within MPCA standards for NAC-1 (55 and 53 dBA, respectively). Effects of nighttime operational noise at the playground would be reduced as the level of activity clearly drops off during those hours defined as nighttime by MPCA (10 P.M. - 7 A.M.). However, the projected increase would affect residences adjacent to the playground.

At receptor two (school) daytime operational noise levels would increase by 2 dBA at the L₅₀ level from 53 to 55 dBA. This increase would be barely perceptible, and would be within MPCA standards (60 dBA). There would be no increases in daytime L₁₀ levels, and the L_{eq} noise levels would increase by 2 dBA to 65 dBA due to project traffic. This would raise the L_{eq} noise level slightly (2 dBA) above the proposed MPCA standard (63 dBA). Nighttime operational noise levels would increase by 2 dBA to 52 dBA at the L₅₀ level and would be barely perceptible. This increase would raise the L₅₀ noise level slightly (2 dBA) above the MPCA NAC-1 standard (50 dBA). Nighttime increases of 6 dBA, to 53 dBA at the L₁₀ level, would be readily noticeable, and an increase of 3 dBA to 52 dBA at the L_{eq} level would be barely perceptible. As in the case of receptor one, the effects of operational noise during nighttime hours at receptor two would be reduced due to the lack of activity at the school. However, the L₅₀ nighttime increase is indicative of the relatively quiet noise environment around the school. L₁₀ and L_{eq} nighttime operational noise levels would be within existing and proposed MPCA NAC-1 standards (55 and 53 dBA, respectively).

At receptor three (apartment building), daytime operational noise levels would not noticeably increase over baseline L₅₀, L₁₀ and L_{eq} levels. Daytime operational L₅₀ noise levels (57 dBA) are within MPCA standards (60 dBA). The baseline L₁₀ and L_{eq} noise levels (66 and 64 dBA, respectively) already exceed MPCA standards (65 and 63 dBA) by 1 dBA. There would be no increase due to project operation at the L₁₀ level, and a slight increase (1 dBA) to 64 dBA due to project traffic at the L_{eq} level. Nighttime operational noise levels would increase perceptibly by 4 dBA at the L₅₀ level to 52 dBA, and exceed MPCA standards (50 dBA) by 2 dBA. A barely perceptible 2 dBA increase to 55 dBA would result at the L₁₀ level and would be within MPCA NAC-1 standards (55 dBA). At the L_{eq} level a barely perceptible increase of 3 dBA to 54 dBA would result; this level would exceed proposed MPCA standards (53 dBA) by 1 dBA.

Noise levels from railroad operations for the proposed project were estimated based on operating conditions on the adjacent Mike's Yard railroad spur and through use of a railroad noise assessment methodology (Wyle Laboratories, 1973). Noise levels from rail operations at the three receptors would be about 40 dBA due to the distance between the source and receptors (2000, 2400, and 3000 feet, respectively) and would not result in an increase in project noise above that produced by the papermill and Hibbard Station (ERT, 1985).

The most prominent noise source during operation of the Hibbard Station is likely to be a conveyance system for sludge and wood bark. A worst case noise level of 90 dBA was assumed at the source of noise. At the three residential receptors, operational noise of the conveyance system is estimated to be, 53, 51 and 54 dBA (L_{eq}) at 3800, 5000, and 3000 feet, respectively. This would not increase daytime noise levels from the papermill at receptors two and three, but would increase noise levels by 1 dBA at receptor one. This increase would be imperceptible and is within MPCA standards. Nighttime noise above levels produced by the papermill would increase by 5, 4 and 2 dBA at the respective receptors, thereby exceeding the proposed MPCA L_{eq} nighttime standard of 53 dBA. These nighttime increases due to operation of the Hibbard Station at receptors one and two (5 and 4 dBA) would be noticeable.

5.3.2 Impacts of the Fully Permitted Action

Operation of all facilities at the fully permitted level would result in slight increases (1 dBA) in noise levels at receptors one and two, and no increase at receptor three. These increases are attributable to increased truck traffic for fuel delivery. The increases would be imperceptible.

5.3.3 Mitigation

Project plans call for the incorporation of the following noise control measures:

Construction

- o Exhaust silencers will be used on internal combustion engines
- o Construction activities will be confined to weekday daytime hours

Operation

- o Building wall and roofing materials will be selected for appropriate sound absorption and transmission loss characteristics
- o Low noise emission equipment will be procured
- o Conveyance system at Hibbard Station will be used during daytime hours (7 A.M. to 10 P.M.) or enclosed to reduce nighttime noise levels.

All noise control measures would be evaluated when equipment layout, room finishes and equipment data are developed. There are no specific mitigation measures for the fully permitted action that would not apply to the proposed action.

5.3.4 No Action Alternative

If the proposed Duluth papermill is not constructed, the noise environment will remain much as it is today, an urban residential area exposed to noise levels associated with noisy urban residential areas as described in Section 4.3.

5.3 References

Bolt, Beranek and Newman, Fundamentals and Abatement of Highway Traffic Noise, 1973.

Environmental Research & Technology, Inc., 1985. Duluth Papermill - Noise, P-D864-500, prepared for PNTA-MPL, Concord, MA.

ERT, see Environmental Research & Technology, Inc.

Federal Highway Administration, 1978. FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December.

FHWA, see Federal Highway Administration.

Minnesota Pollution Control Agency, 1983. Minnesota Rules, Chapter 7010.0400 of MPCA Noise Pollution Control Rules (Statutory Authority: MS166.07 subds 2.4) and Draft 12, Section 7010.0140.

Stevens, K. N., W. A. Rosenblith, and R. H. Bolt, 1955. "A Community's Reaction to Noise: Can It Be Forecast?" Noise Control 1:1, pp. 63-71.

Wyle Laboratories, 1973. Assessment of Noise Environments Around Railroad Operations, WCR 73-5.

5.4 LAND USE

Land use impacts resulting from the construction and operation of the project would be both direct and indirect. Direct impacts would consist of the removal of approximately 90 residential units and relocation of four operating businesses from the proposed site to clear the area for facility construction. Indirect impacts to land uses adjacent to the project site include traffic, noise, odor and dust during construction and operation.

5.4.1 Impacts of the Proposed Action

Assessment of project land use impacts involves consideration of existing land uses, zoning, and future land use plans associated with the project site. The assessment also includes consideration of aesthetics.

5.4.1.1 Existing Land Use

Much of the eastern and southern portions of the site have a history of commercial/industrial usage, which has since been abandoned. The project would have a positive effect by returning these areas to productive land while concurrently removing the unsightly remains of past businesses.

The principal project impact would result from the alteration, through relocation, of the residences and operating businesses which exist generally in the northern and western sections of the project site. Purchase of homes and relocation of home owners is not anticipated to be an issue due to the depressed local housing market.

There are no special locational advantages specific to the site which affect the remaining businesses within the project area. Therefore, their relocation to other sites within the city would not be detrimental to business. There is a surplus of industrial land within the city which would be available for displaced industries (ERT, 1985).

Much of the current residential area would become a landscaped buffer zone extending from the proposed papermill and administration building at 52 Ave. and 53rd Ave., west to the western site boundary along Central Ave.

This approximately 600 foot wide buffer zone would separate the papermill and accompanying visitor and administrative structures from the Irving playfield and residential neighborhoods to the west. Thus, the proposed use would not significantly impact nor be incompatible with the land uses to the west, including sensitive institutional and public land uses such as churches, schools, and the Irving playfield. Residential lands to the north would be separated from the proposed papermill by Interstate-35. The project is not anticipated to cause further displacement in the surrounding areas.

Approximately 27 acres (29 percent) of the 92 acre site would be covered by impervious surface including building roofs, log storage pads, and roads. The site currently has an estimated 15 acres (16 percent) of impervious surface.

Reactivation of the Hibbard Station represents a positive land use impact as the abandoned building and associated lands would be returned to productive use. The close proximity of the steam generation facility to the project precludes the necessity of developing an extensive utility infrastructure to supply steam to the mill. Onsite transmission lines and the railroad spur which traverse the site would remain.

Consistent with existing conditions, the project would not eliminate any recreational opportunities. The public will be allowed access to the existing man-made peninsula.

Indirect land use impacts are not anticipated to be significant. Construction-related traffic and noise would be short-term (24 months) and generally confined to weekday daytime hours. Construction traffic would be greatest before the morning peak commuter period and during the afternoon peak commuter period. Operational traffic would be considerably less (about 300 employees and 100 trucks per day). Traffic impacts are discussed further in Section 5.5. Operational noise from the project would occur 24 hours a day; further discussion of these impacts is found in Section 5.3.

5.4.1.2 Zoning

Areas within the project site zoned M-1 and R-2 would have to be rezoned to an M-2 manufacturing zone district, which would require at least one public meeting. The rezoning process for the proposed project will be the responsibility of the City of Duluth.

Rezoning areas within the project site is not anticipated to impact zoning designations of adjacent areas. Areas to the south are zoned both M-2 and W-1 (Figure 4.4-2). Consistent with these zoning designations, these areas are dedicated to manufacturing and other uses advantageously served through direct access to water transportation and large quantities of raw water. The proposed landscape buffer as well as I-35 form distinct man-made boundaries between the M-2 and residentially zoned districts, and should preclude encroachment of additional manufacturing uses into these neighborhoods.

The proposed action would not conflict with floodplain and shoreland management regulations. The project would not adversely affect the efficiency or unduly restrict the capacity of channels or floodways and any other drainage facilities or systems in the storage or removal of floodwaters (Section 5.2).

5.4.1.3 Enterprise Zone and Land Use Planning

The proposed project represents part of the industrial development plan for Duluth and is consistent with the requirements of the Border City Enterprise Zone Program, as discussed in Section 4.4. The project would create new employment in the city and would not result in a reduction of the assessed value of the existing property. The City Planning Commission proposed the site as a target area for the enterprise zone, and will take an active role in the purchase and rezoning of properties on site.

The project is also consistent with the Land Use and Management Plan for the Duluth-Superior Harbor, although the site is only partially within the harbor area planning zone. The plan calls for maximization of harbor resources through the multiple and complementary use of land and water areas of the harbor. The symbiotic relationship between the Hibbard Station, a water dependent land use, and the proposed project supports this objective. Project consistency with the Harbor Plan is indicated by the following points: the Hibbard Station is to continue at its current site; neighborhood access to the waterfront would not be precluded by the proposed development; and no conservation areas designated by the plan would be disrupted by the project.

5.4.1.4 Aesthetics

The development of the project would have a positive impact on the visual character of the local area. Whereas there are currently several land use types and abandoned commercial/industrial facilities within the 92 acre site, the project would remove these and unify the entire site into one land use type with a landscaped visual buffer separating the actual operations area from nearby residential areas. Three relatively prominent visually unattractive landmark areas within the project site will be removed. These are the abandoned Chun King building, the abandoned Union Compressed Steel Scrap Yard, and the Stellan Fuel/Maintenance Yard.

5.4.2 Impacts of the Fully Permitted Action

Land use impacts under the fully permitted action are the same as for the proposed action.

5.4.3 Mitigation

Land use impacts due to removal of existing residential and commercial properties would be mitigated by the purchase of these properties at a fair market value. Further discussion of the relocation process and applicable guidelines is found in Section 5.9. A variety of residential and industrial/commercial properties are available elsewhere in the city for relocation due to the generally depressed real estate market in the area. While it is anticipated that the development of the site will improve the visual quality by removing several visually unattractive features and unifying land uses on the site, a landscaped buffer zone will be created between the plant and remaining residential areas to the west.

5.4.4 No Action Alternative

Under the no action alternative, no modifications would be made to the Hibbard Station and the papermill would not be constructed and operated. In the short term, the area would continue to be used as it is currently. None of the vacant parcels would likely be developed for residential use. The West Duluth area is already heavily commercialized and it is the city's long-range plan to develop the site for industrial use.

5.4 References

Environmental Research & Technology, Inc., 1985. Duluth Papermill - Land Use and Zoning, P-D864-600, prepared for PNTA-MPL, Concord, MA.

ERT, See Environmental Research & Technology, Inc.

5.5 TRANSPORTATION

Development of the project would result in increased traffic demand due to construction of the facility, and new employee commuting trips to and from the site during facility operation. Similarly, the project would generate additional truck and rail traffic for receipt of supplies and shipment of products.

5.5.1 Impacts of the Proposed Action

To assess the traffic impacts due to construction and operation of the facility, the following transportation scenarios were considered:

- o 1987 Peak Construction
- o 1988 Baseline (without project)
- o 1988 Cumulative (with project)

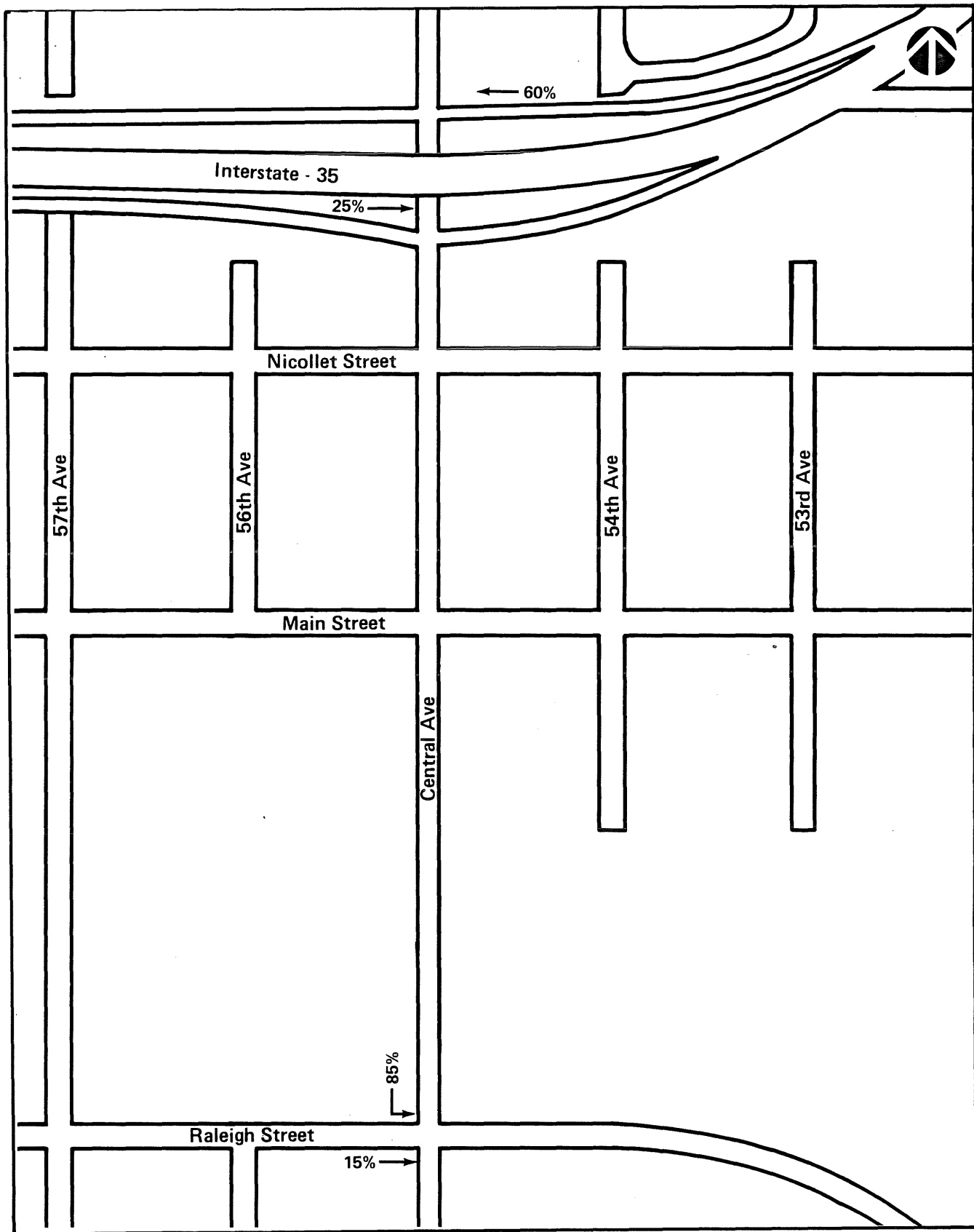
In all three scenarios, a traffic growth rate of 1.0 percent per year simple growth was used to project the existing 1985 traffic volumes to the scenario year baseline traffic volumes. Detailed descriptions of the methodologies employed in these analyses are presented in the Technical Report on Transportation.

5.5.1.1 Peak Construction - 1987

Of the three scenarios considered, the 1987 peak construction scenario would generate the most traffic and have the most impact on the roadway network around the project site. Construction will last approximately 2 years, and have a peak period of 6 months. The peak construction period has been conservatively assumed to generate a total of 1600 employees and 1000 trucks per day. Of the 1600 employees, 25 percent are expected to arrive during the A.M. commuter peak hour and 25 percent are expected to depart during the P.M. commuter peak hour. The remaining arrive or depart during off peak hours. The 1000 trucks would arrive and depart the site during the course of a ten-hour work day. Assuming the truck trips to be evenly distributed over a ten-hour day and increased by 50 percent over the hourly average, it is expected that 150 trucks would arrive during the A.M. commuter peak hour, and 150 would depart during the P.M. commuter peak hour. Assuming a vehicle occupancy rate of 1.25 persons per vehicle for the employee generated traffic, the following vehicular trip generation was estimated:

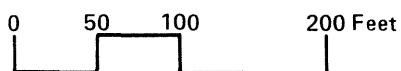
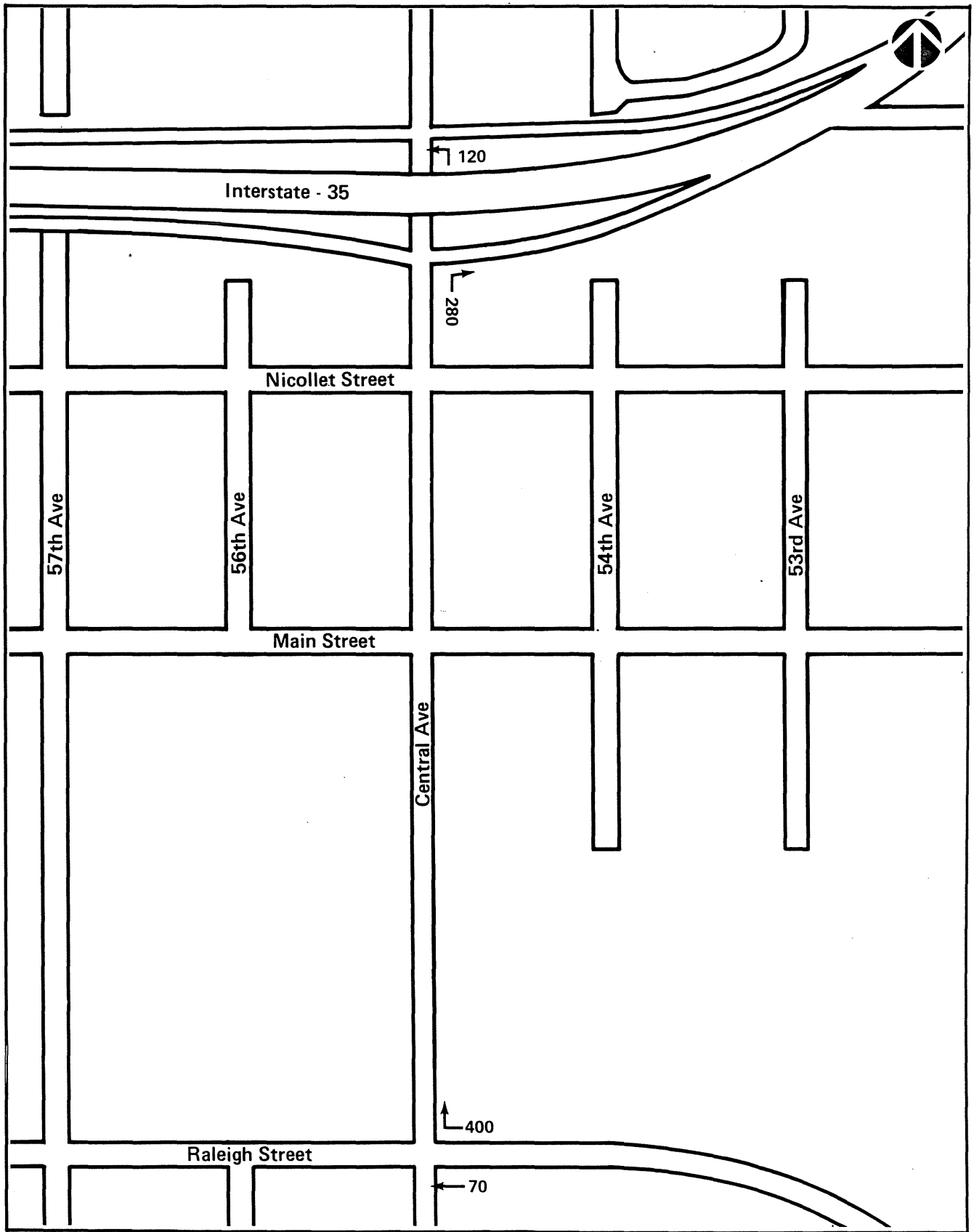
$$\begin{aligned} & (1600 \text{ employees}) \\ & \times (25\% \text{ during peak hour}) \text{ divided by } (1.25 \text{ person per vehicle}) \\ & + (150 \text{ trucks during peak hour}) \\ & = 550 \text{ vehicles arriving during the A.M. peak hour, and 550 vehicles} \\ & \text{departing during the P.M. peak hour.} \end{aligned}$$

The directional distribution of facility generated traffic was arrived at through an examination of the journey to work data collected in the 1980 U.S. Census (ERT, 1985). Figure 5.5-1 illustrates the directional distribution of project generated traffic on the local road network. Figures 5.5-2 and 5.5-3 illustrate the generated vehicular demand for the A.M. and P.M. peak hours, respectively.



0 50 100 200 Feet

Percent Distribution of Project Generated Traffic



**Peak Construction Generated
Traffic - PM Peak Hour**

To obtain baseline traffic demand in 1987, the year that the peak construction period is expected to occur, the 1985 traffic volumes were increased by 2 percent (1.0 percent per year simple growth) from 1985 to 1987. Figures 5.5-2 and 5.5-3 illustrate traffic demand for the 1987 A.M. and P.M. peak hours, respectively. Level of Service (LOS) calculations for the 1987 peak construction scenario are summarized in Table 5.5-1.

As shown in Table 5.5-1, operating conditions below LOS "C" would occur in one case. The intersection of Central Avenue and the I-35 southbound on/off ramps would operate at a LOS "D" condition during the A.M. peak hour. This is due to the fact that an estimated 280 vehicles would travel down the I-35 off ramp and proceed left onto Central Avenue. This large volume of left-turn movements would experience long delays, and thus reduce the operating efficiency of the intersection.

The intersection of Central Avenue and Raleigh Street/Old Route 2 would operate at a LOS "A/D" during the A.M. peak hour. The west approach to this intersection on Old Route 2 would operate at a LOS "A", while the east approach on Raleigh Street would operate at a LOS "D". In the P.M. peak hour the west approach on Old Route 2 would also operate at a LOS "A", while the east approach would operate at a LOS "E". Those decreases in the operating efficiency of the intersection would result from the large volume of construction related vehicles arriving and departing the site and the lack of capacity due to existing stop sign control. With the addition of a police officer during the peak commuter hours, this intersection would operate at a LOS "C".

5.5.1.2 Construction Parking and Staging

For purposes of analyzing parking and staging requirements for construction, the following assumptions were used:

- 1600 employees
- divided by 1.25 employees per car
- x 300 square feet for parking per car
- divided by 43,560 square feet = 8.8 acres required for parking
- + 2 acres required for staging of materials and equipment.

The triangular portion of the southeast corner of the project site bounded by Old Highway 2 to the south would provide 9.8 acres of space for parking and staging. If property between the Burlington Northern Railroad tracks and the nearby caryard adjacent to this triangular parcel at the southeast corner of the proposed site were acquired, an additional 3.4 acres would be available for parking and staging needs during construction. This would result in a total of 13.2 acres providing a surplus of 2.2 acres for construction parking and staging. This parking area would be available at the start of the construction period.

5.5.1.3 1988 Baseline - Without Project

In analyzing the 1988 baseline scenario, a traffic growth factor of 3 percent was used to project the existing 1985 traffic volumes to the 1988 traffic volumes. Table 5.5-2 is a summary of the resulting levels of

Table 5.5-1. 1987 Peak Construction Period Levels of Service

Intersection	Level of Service	
	A.M.	P.M.
Central Avenue at I-35 southbound on/off ramps	D ^a	C
Central Avenue at I-35 northbound on/off ramps	C	C
Central Avenue at Nicollet Street	B	C
Central Avenue at Main Street	B	A
Central Avenue at Raleigh Street	A/D ^a	A/E ^a

Source: ERT, 1985.

- a. Through use of police officer control for the construction worker peak commuting hour during the A.M. period, a Level of Service "C" operation can be achieved.

Table 5.5-2. 1988 Baseline Levels of Service

Intersection	Level of Service	
	A.M.	P.M.
Central Avenue at I-35 southbound on/off ramps	A	B
Central Avenue at I-35 northbound on/off ramps	A	A/B
Central Avenue at Nicollet Street	A	A
Central Avenue at Main Street	A/B	A/B
Central Avenue at Raleigh Street	A	A

Source: ERT, 1985.

service. As is shown in Table 5.5-2, all of the intersections analyzed would operate at or above LOS "B" condition. None of the intersections analyzed during the 1988 baseline scenario would have long delays or queues.

5.5.1.4 1988 Cumulative - With Project

The project when operational would employ approximately 300 people and generate approximately 70 trucks on average per day. The employees would work in three shifts during a 24-hour workday. It is estimated that 160 employees will work the first shift, 70 the second, and 70 the third shift. Also, it is estimated that the first shift will arrive and the third shift will depart from the site during the A.M. peak hour; and the first shift will depart and the second shift will arrive during the P.M. peak hour. Assuming that some of the trucks and visitors would arrive at and depart from the site during the peak hours, the following site generation totals result:

<u>A.M. Peak Hour</u>	<u>P.M. Peak Hour</u>
175 Vehicles in 80 Vehicles out	180 Vehicles out 80 Vehicles in

Figures 5.5-4 and 5.5-5 illustrate the project generated traffic demand during the A.M. and P.M. peak hours, respectively.

Adding the project generated traffic to the 1988 baseline traffic volumes results in the 1988 cumulative traffic scenario. Capacity analyses using the 1988 cumulative traffic volumes were performed to find out how well the existing roadway network could handle the increased traffic demand. The results are summarized in Table 5.5-3.

As is shown in Table 5.5-3, all of the intersections analyzed would operate above the LOS "C" standard. The lowest LOS resulting from the 1988 cumulative scenario would be at the Central Avenue I-35 southbound on/off ramps intersection, with a LOS "B/C" condition.

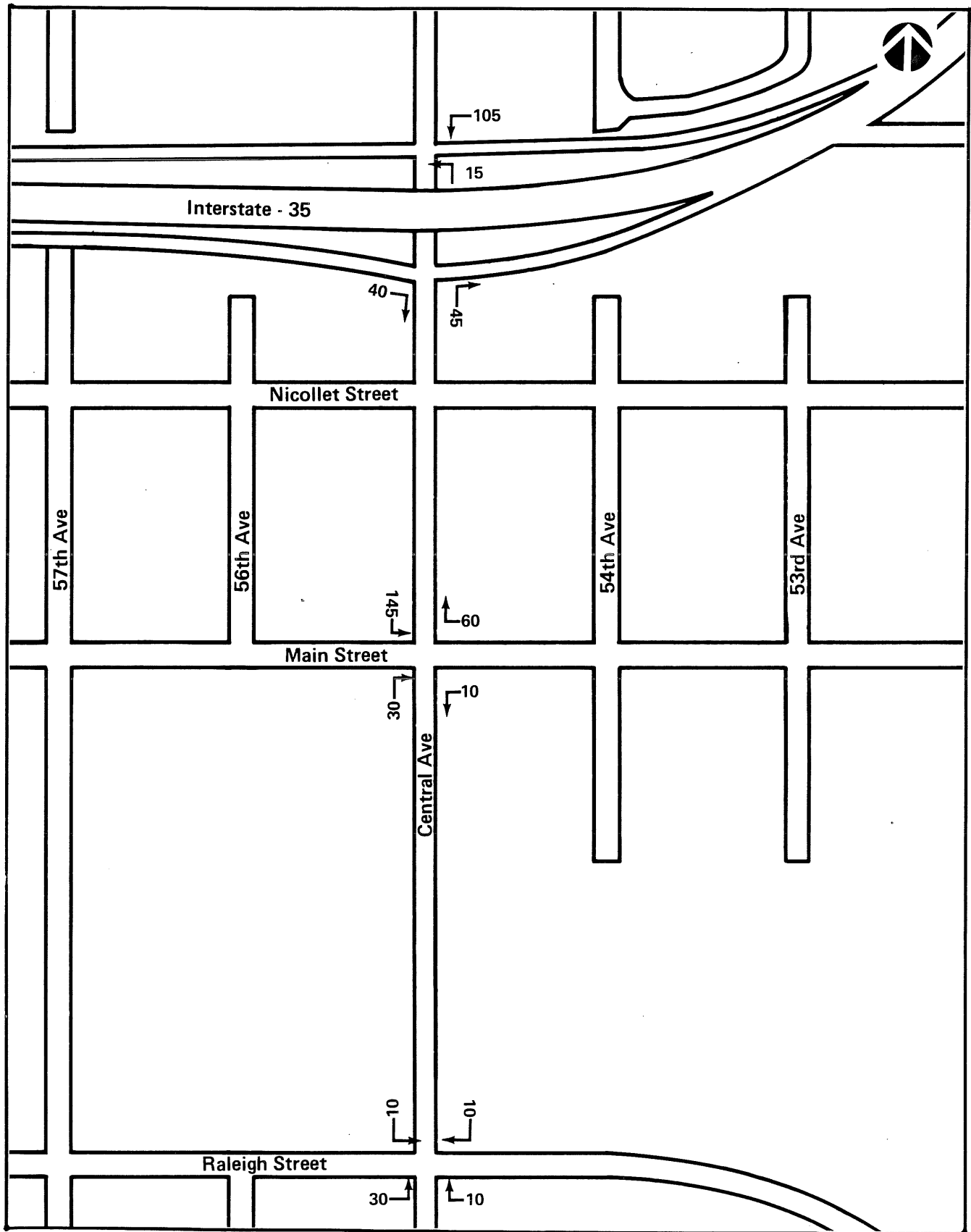
The existing roadway network around the proposed project site should offer no problems handling the increased traffic demand due to the operation of the project.

5.5.1.5 Project Related Accidents

In 1984, a 5.1 mile, four-lane segment of Interstate 35 in Duluth had an accident rate of 3.1 per million vehicle miles travelled (MNDOT). The same accident rate, 3.1, also applies to the 0.7 mile, six-lane segment of I-35 in Duluth.

There will be two components of potential project-related accidents from the proposed project - employee and truck trips. For employee traffic the following assumptions were made:

$$\begin{aligned} & 300 \text{ employees} \times 2 \text{ trips/day} \times 20 \text{ miles travelled} \times 260 \text{ days/year} \\ & = 3,120,000 \text{ vehicle miles travelled} \end{aligned}$$



0 50 100 200 Feet

**Project Generated Traffic - AM
Peak Hour**

Table 5.5-3. 1988 Cumulative Levels of Service

Intersection	Level of Service	
	A.M.	P.M.
Central Avenue at I-35 southbound on/off ramps	A	B/C
Central Avenue at I-35 northbound on/off ramps	A	A/B
Central Avenue at Nicollet Street	A	A/B
Central Avenue at Main Street	A/B	A/B
Central Avenue at Raleigh Street	A	A

Source: ERT, 1985.

Based on an accident rate of 3.1 accidents per million vehicle miles travelled (VMT), 9.7 accidents are estimated to result from project employee traffic on I-35. The exact location of the origin of wood and coal for use at the Hibbard Station is unknown at this time. The Lake Superior Paper Company will purchase wood and coal based upon cost and availability. For purposes of this analysis, truck traffic accident estimates were made based on the following assumptions:

$$\begin{aligned} & 99 \text{ trucks} \times 2 \text{ trips/day} \times 50 \text{ miles travelled} \times 260 \text{ days/year} \\ & = 2,574,000 \text{ VMT} \end{aligned}$$

Based on an accident rate of 3.1 accidents per million VMT, 8.0 accidents are estimated to result from project truck traffic on I-35. Adding the number of accidents estimated from project employee traffic (9.7) to project truck traffic (8.0) results in a total of 17.7 accidents per year on I-35.

5.5.1.6 Railroad Facilities

During the construction of the project, large components of the paper machine will be shipped to the site by rail. In addition, an unspecified amount of goods and materials will also be shipped by rail to the site. Quantities of such materials will be determined at a later date depending upon location of purchase and cost of transport.

During project operation, approximately 653 tons of paper will be produced per day. Of this total, about 70 percent or 457 tons per day will be shipped by rail. Given the capacity of the cars currently hauling freight on the line proximate to the project site (70 to 100 tons per car), 5 to 7 cars per day will be needed to handle the paper transport requirements of the proposed project. This number of additional cars can be readily accommodated by the existing rail line and nearby caryard (capacity of 275 cars).

5.5.2 Impacts of the Fully Permitted Action

This alternative would result in an additional 38 trucks over the daily average to the steam station delivering wood and coal. This would produce 24 total truck trips (12 entering and 12 exiting) during peak hours on Old Route 2. This is an increase of 6 total truck trips (3 entering and 3 exiting) during the peak hours above that for the proposed action and would not result in a change in Level of Service conditions analyzed in Section 5.5.1.4.

5.5.3 Consistency with State and City Transportation Plans

Consistency of the proposed project with transportation program objectives of MNDOT and the City of Duluth was assessed. A review of the 1986-1987 Transportation Improvement Program (TIP) for the Duluth Superior Urbanized area indicated that no major capital construction improvements are forecast for the West Duluth area. The project's compatibility with the existing roadway network was assessed by calculating the level of service along Central Avenue between the I-35 ramps and Raleigh Street/Old Highway 2 during project construction and operation. These findings are contained in Sections 5.5.1.1 and 5.5.1.4 and show no serious capacity problems that can-

not be mitigated with local police control. The load carrying capacity of the roads providing both truck deliveries of wood, coal and pulp and employees was also reviewed. The City of Duluth's Engineer has found the city streets in the vicinity of the project to be adequate to meet load requirements (telephone conversation with city Traffic Engineer). MNDOT is currently in the process of gathering data from 15 papermills, including Lake Superior Paper, on points of origin and destination and likely routing of wood products around the state. Once these data are accumulated, MNDOT will assess the effects on trunk highways including those routes servicing the proposed project (telephone conversation with MNDOT Transportation Planner).

5.5.4 Mitigation

During construction of the proposed project, police officer control would be utilized during peak A.M. and P.M. commuting hours at the intersection of Central Avenue and Raleigh Street and during the A.M. peak hour at Central Avenue and the I-35 southbound on/off ramps. Such mitigation would achieve a Level of Service "C" operation at the above locations.

5.5.5 No Action Alternative

As documented in Section 5.5.1.3, 1988 traffic conditions in the project area would operate at or above Level of Service "B" condition. None of the intersections analyzed during the 1988 baseline scenario would have long delays or queues.

5.5 References

Environmental Research & Technology, Inc., 1985. Duluth Paper Mill-Transportation, P-D864-400, prepared for PNTA-MPL, Concord, MA.

ERT, See Environmental Research & Technology, Inc.

5.6 GEOLOGY, SOILS, AND GROUNDWATER

Construction and operation of the project involves a number of factors which potentially affect the prevailing geology, soils and groundwater conditions. Potential impacts could stress baseline environmental conditions and require mitigative measures to minimize environmental disruption.

Available data suggest that unregulated waste management practices have been prevalent onsite. As a consequence, some environmental impairment is already evident. Hence, the overall impact of a carefully planned, constructed and monitored site development would be notably positive. The removal of surface and buried wastes under the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) would be beneficial to the area, regardless of the final site development (Pulford, 1985).

5.6.1 Impacts of the Proposed Action

Project construction activities are not expected to penetrate the bedrock, however; the excavation, grading, and filling of surficial soils in areas where structures and paved surfaces are planned will disrupt the native soils still existing on the site. They will be permanently impacted in areas where excavation takes place. Most of the existing fill soils will be removed from the building site. Recompacted granular fill will be reused when practical, along with imported fill. Site topography will not be substantially altered. Local irregularities which currently exist, due to dumping, will be leveled (STS, 1984). Land clearing and construction activities such as excavation, filling, and grading will result in erosion and sediment transport through surface water runoff.

Due to evidence of soil contamination onsite, the excavation and removal of degraded soils may be necessary before construction in the affected areas. The Lake Superior Paper Company has submitted a remedial investigation/feasibility (RIFS) study which will determine the most appropriate remedial alternatives. The proposed inclusion of contaminated portions of the site in CERCLA cleanup operations would have a positive impact on the quality of the surficial environment.

Where underground storage tanks are present, a work plan will be designed for their removal during the construction phase in order to minimize the possibility of contamination of surrounding soils or groundwater. The overall impact on the site soils of a carefully designed and executed tank removal plan would be positive.

All solid waste handling during the operation phase will occur above ground. Wastewater will be discharged to the municipal sanitary sewer system. Therefore, the potential for soil contamination resulting from the facility operation is minimal.

The percentage of the ground surface covered by buildings and pavement is not expected to change to an extent great enough to significantly alter the groundwater table on the site. Dewatering may be necessary during

construction due to shallow groundwater depths. This would locally depress the water table on a temporary basis. Various dewatering alternatives may be employed (STS, 1984).

There is evidence of groundwater contamination on the site. Withdrawal and treatment of the contaminated water may be necessary. A proposed response action plan for the affected area has been submitted to the MPCA for review and approval. This plan is discussed in Section 5.7.

5.6.2 Impacts of the Fully Permitted Action

The impacts on geology, soils, and groundwater of the fully permitted action will not be different from the impacts of the proposed action.

5.6.3 Mitigation

Mitigative measures that will be used when practical to minimize erosion and the offsite migration of sediment-laden waters (see Section 5.2) during construction of the papermill will be as follows:

- o Install diversion ditches around earth excavation areas
- o Excavate sedimentation basins, down-slope of earthwork areas
- o Install filter fabric fences or hay bale rows down-slope of earthwork areas
- o Minimize exposure of disturbed soils
- o Cover earth stockpiles
- o Seed and mulch completed earthwork surfaces as soon as possible
- o Pave parking lots and roads as soon as possible after preparation

Underground storage tanks on the site will be removed and a work plan will be formulated to minimize the risk of soil and groundwater contamination during tank removal. This work plan will include the following:

- o An assessment of the age, construction, location, position, and contents of the tanks
- o An excavation and removal plan
- o A plan for offsite transport and disposal
- o A plan for the assessment of soils and groundwater quality in the vicinity of the tanks
- o A health and safety plan, to ensure the safety of personnel involved in tank removal

Mitigation of hazardous waste contaminated areas on the site is discussed in Section 5.7. Mitigative measures for impacts associated with the fully permitted action are the same as those for the proposed action.

5.6.4 No Action Alternative

The impacts associated with the no action alternative will most likely be similar to the impacts associated with the proposed action or the fully permitted action. This is because cleanup of the site under CERCLA would take place regardless of the final surface configuration of the area. Without implementation of the project, however, the existing underground tanks on the site would remain and some may continue in use. Consequently, their potential for soil and groundwater contamination would continue. No accelerated erosion or sedimentation will occur under the action alternative.

5.6 References

Pulford, G.A., 1985. Letter from Pulford, Minnesota Pollution Control Agency, to T. Thornton, Rider, Bennett, Egan and Arundel about scrap removal and remedial investigation at the Union Compressed portion of the West Duluth Industrial site, November 25.

STS Consultants, Ltd., 1984. Subsurface Exploration and Engineering Report for the Proposed Industrial Facility to be Located Near the Minnesota Power Hibbard Plant in West Duluth, Minnesota, Report No. _____ prepared for _____, Minneapolis, MN.

5.7 SOLID AND HAZARDOUS WASTES

Potential environmental impacts will result from the solid and hazardous waste streams associated with the project. These wastes will be generated during all phases of the project including site preparation (demolition debris and on-site solid and hazardous waste), papermill operation (mill trash and wastewater sludge), and operation of the Hibbard Station (ash).

5.7.1 Impacts of the Proposed Action

This section contains a description of solid waste generation, reuse potential, and disposal options, and the proposed cleanup of the onsite hazardous wastes that will occur due to the construction and operation of the project. This evaluation also includes the impacts from reactivating and operating the Hibbard Station to supply steam to the papermill.

5.7.1.1 Description of Solid Waste Streams

The project will generate solid waste streams that can be divided into five major categories:

- o Demolition type wastes generated during the clearing of the project site and the rebuilding of the Hibbard Units 3 and 4.
- o Solid waste uncovered during site excavations.
- o Ash generated at the Hibbard Station during the production of steam from combustible fuels.
- o Refuse generated by operation of the mill.
- o Solids contained in process wastewater.

Demolition wastes will be generated during the preparation of the site where over 70 residential, and several commercial and industrial buildings will be removed from the site and during the retrofitting of Hibbard Units 3 and 4. The major constituents of this waste are fragments of wood, plaster, cement, masonry, metal pipes, etc. Asbestos will be removed from the Chun King building and the Hibbard Station. Small quantities of asbestos may also be generated in the demolition of the residential units. Approximately 5700 cubic yards (C.Y.) of demolition waste will be generated by the project as a one-time waste. The demolition schedule calls for four truck loads/week (20 C.Y. trucks) over the period from May 1986 to January 1988.

Unknown quantities of solid wastes disposed of onsite by past, unregulated activities are likely to be encountered during construction. The ultimate disposal of these materials as solid waste or demolition debris will be determined after the nature of the materials is ascertained.

The preparation of the site will require that the existing scrap material at the Union Compressed Steel Scrapyard be removed. This material includes scrap metal, battery casings, household appliances, drums, and miscellaneous scrap. Future studies will identify those materials which are

uncontaminated and can be salvaged or landfilled and these materials, if any, which are contaminated and must be disposed of by other means.

Ash type waste will be generated by the Hibbard Station. The plant will utilize materials generated by the papermill, such as bark and wastewater sludge, as well as coal and wood chips, to produce steam for use by the papermill. The ash produced will consist of mostly inorganic residues remaining after fuel combustion. The proposed action will produce an estimated 7608 tons/year of ash.

Refuse generated at the mill will be similar in character to that generated by residences and other commercial establishments. The estimated 2400 tons/years of refuse will include paper, plastics, metal, glass, rubber, and other items.

Effluent from the mill's primary clarifier will be discharged to the WLSSD sanitary sewer system. The resulting secondary sludge will be incinerated at the WLSSD Wastewater Treatment Plant (WWTP) leaving an estimated 4200 tons/year of ash.

Table 5.7-1 is a summary of the quantities of wastes expected from the papermill and identifies the respective sources.

Table 5.7-1. Projected Solid Waste Quantities

Waste Type	Source	Quantity	
		Weight (Tons/Yr)	Volume (CY/Yr)
Demolition	Proposed site	-	5700 ^a
Buried solid waste	Proposed site	-	Unknown
Scrap material	Scrapyard	-	Unknown
Ash	Incineration residue	7600	
Mill refuse	Papermill	2400	
Wastewater sludge	WLSSD WWTP	4200	

Source: Adapted from ERT, 1985.

a. Volume on a one-time basis instead of yearly.

5.7.1.2 Ash Characteristics

On the basis of tests performed on ash generated by processes which are very similar to those in the proposed project, the ash generated by this project should not be hazardous, as defined in Minnesota hazardous waste regulations (Minnesota Rules, Chapter 7045). As liquids percolate through the wastes in the environment, portions of the wastes are dissolved and carried along with liquids, creating leachate. In order to determine the best method of disposal for different wastes, leachate characteristics must be predicted.

Two standard leach tests are used by MPCA to make this determination. The EP Toxicity test is designed to imitate environmental conditions which would occur if an industrial waste were buried with municipal refuse undergoing biological decomposition. The test uses an acidic leaching medium and thus the pH of the waste is fixed by external conditions. The American Society for Testing and Materials (ASTM) water leach test uses deionized water as the leaching medium, allowing the waste itself to determine the pH of the leachate. Thus, the ASTM procedure is more indicative of the leaching environment when power plant ash is the only waste disposed of at a site.

Tables 5.7-2 and 5.7-3 display the results of EP toxicity and ASTM water leach tests performed on power plant wastes from the Champion - Sartell paper plant (ERT, 1985). These tests were performed on two waste streams: ash and scrubber cake. The wastes from this plant are generated by burning a combination of coal, bark and wood chips, and dewatered wastewater sludge, similar to the process proposed for the proposed facility. Scrubber cake is a byproduct of a process designed to remove sulfurous particulates from the chimney stream. It is expected that the fly ash from the project would be similar to the scrubber cake in chemical characteristics.

The comparison of the EP Toxicity test data with MPCA levels for co-disposal (Table 4.7-1) show that all concentrations are acceptable except for the cadmium concentration reported for the scrubber cake. Data have not been provided, however, for all parameters required for the MPCA evaluation. A similar comparison of the ASTM water leach test data to MPCA levels shows most concentrations within acceptable levels except for fluoride, manganese, total dissolved solids, sulfate, and pH for the scrubber sludge. The data from these tests are not conclusive and an analysis of the actual wastes would have to be submitted to MPCA for their consideration to co-dispose the ash at a sanitary landfill.

5.7.1.3 Reuse Potential

The wood wastes generated by the papermill will be used as fuel at the Hibbard Station. All other solid waste from the mill will be used by the WLSSD to produce RDF, for the incineration of sludge from the wastewater treatment facility. This proposed reuse demonstrates the utilization of solid wastes and the minimization of disposal requirements. The remaining wastes to be considered for reuse are power plant ash and incinerator residue. Typical power plant ash is commonly used in many parts of the country as landfill cover, road sand, structural fill in building and embankments, and as an addition to portland cement concrete. With the introduction of wood ash into the coal ash, the physical and chemical properties are anticipated to change, with the tendency to be an adverse impact. Reuse of ash from Hibbard Station is not expected to be viable in the project area.

The WLSSD incinerator residue is anticipated to have concentrated metals and to be acidic. Such characteristics limit the potential for reuse, as they are detrimental to solidification processes or structural uses. The potential for incinerator residue reuse is very low in the project area.

Table 5.7-2. Summary of EP Toxicity
Tests/Champion - Sartell^a

Parameter	Units	Hazardous Waste Limit	Boiler Ash	Scrubber Cake
Arsenic	mg/L	5.0	<0.001	0.007
Barium	mg/L	100.0	1.0	<0.2
Cadmium	mg/L	1.0	<0.01	0.6
Chromium	mg/L	5.0	<0.05	<0.05
Lead	mg/L	5.0 ¹	<0.1	<0.1
Mercury	mg/L	0.2	<0.0002	<0.0002
Selenium	mg/L	1.0	<0.001	0.024
Silver	mg/L	5.0	<0.02	<0.02

a. Current Minnesota hazardous waste regulations (6 MCAR 4.9002) indicate a hazardous waste limit of 3.0 $\mu\text{g}/\text{m}^3$ for lead. Proposed rules (June 7, 1982) indicate a hazardous waste limit of 5.0 $\mu\text{g}/\text{m}^3$ for lead.

Table 5.7-3. Summary of ASTM Water Leaching Tests
Champion - Sartell

Parameter	Units	Drinking Water Standard	Boiler Ash	Scrubber Cake
Arsenic	mg/L	0.05 ^a	0.008	0.002
Barium	mg/L	1.0 ^a	<0.2	<0.2
Cadmium	mg/L	0.01 ^a	<0.01	<0.01
Chloride	mg/L	250. ^b	5.3	6.4
Chromium-total	mg/L	0.05 ^a	<0.05	<0.05
COD	mg/L	--	54	<20
Copper	mg/L	1. ^b	<0.02	<0.02
Cyanide	mg/L	--	<0.02	<0.02
Fluoride	mg/L	1.4-2.4 ^c	0.30	9.8
Iron	mg/L	0.3 ^b	<0.03	<0.03
Lead	mg/L	0.05 ^a	<0.005	<0.005
Manganese	mg/L	0.05 ^b	<0.01	0.09
Mercury	mg/L	0.002 ^a	<0.0002	<0.0002
Nickel	mg/L	--	<0.04	<0.04
Nitrate-N	mg/L	10. ^a	<0.10	0.54
Oil & grease	mg/L	--	8	7
Phenols	mg/L	--	<0.01	<0.01
Selenium	mg/L	0.01 ^a	0.001	0.044
Silver	mg/L	0.05 ^d	<0.02	<0.02
Total dissolved solids	mg/L	500. ^b	88	2,380
Sulfate	mg/L	250. ^b	50.0	1,730
Zinc	mg/L	5. ^b	<0.01	<0.01
Boron	mg/L	--	1.1	2.7
pH	pH units	6.5-8.5 ^b	9.9	9.1

Source: Rieke, et al., 1981 and PMT, 1984.

a. National Interim Primary Drinking Water Standards (40 CFR 141).

b. National Secondary Drinking Water Standards (40 CFR 143).

c. Fluoride limit depends on average air temperature.

In addition to the above considerations for alternative solid waste stream dispositions, there is the possibility for using Refuse Derived Fuel (RDF) from the WLSSD Resource Recovery Facility at Hibbard Station for power generation. Currently, RDF production is not sufficient for Hibbard Station needs. The feasibility of using RDF at Hibbard Station will be reevaluated in the future if sufficient volume is available.

5.7.1.4 Ash Disposal Methods

The principal disposal options are land based, as follows:

- o Co-disposal - disposal of ash and residue with other types of refuse at a landfill. All wastes are mixed or layered as they arrive at the site
- o Dedicated section of landfill - disposal of ash and residue in a special section of a landfill. The ash and residue are segregated from other waste types

Co-disposal is a common method of disposal whereby a variety of wastes are accepted and landfilled together. This is generally the simplest method requiring the least equipment, labor and general operating procedures. The costs are also generally less. Often operators will utilize a uniformly textured industrial waste as cover for temporary road construction and general grading. However, some metals in the ash may be more easily leached under the acidic conditions in a mixed waste cell, but may be attenuated more readily by the soil. Therefore, the wastes must be tested for leachate characteristics to determine if co-disposal is more appropriate than separate disposal. In addition, during cold or hot dry windy weather, the potential for fugitive dust generation is very high, especially for fly ash. The ash, if spread over a large area and not covered by soil is subject to release not only by air, but by adhering to vehicle wheels.

A dedicated portion of an existing landfill is another disposal alternative. The major advantage to the dedicated portion of a landfill is related to overall land use and environmental impact. If wastes are segregated into separate disposal cells, then pollutants/leachate can be more easily traced to the source and corrective action can be designed for specific waste cells. A disadvantage of separate disposal is the higher costs due to additional equipment requirements and operating costs.

The existing Rice Lake Landfill operated by WLSSD is the most logical destination for the wastes generated by the project. The disadvantages to this site are as follows:

- o Due to the proximity of the Rice Lake site to the Duluth airport, the FAA has restricted the wastes to be disposed of to non-putrescible wastes. The disposal of putrescible wastes (municipal refuse) is an attraction for birds who pose a hazard to aircraft.
- o Wastes disposed at Rice Lake from 1965 to 1982 did not have leachate collection and treatment. Therefore, leachate generation continues in a partially uncontrolled environment, even though a leachate control system has been installed in the newly developed sections.

- o The site has been included in the Minnesota Superfund list. This action was required because of the leaching from the old landfill sections.

These disadvantages can be minimized by restricting the wastes to ash and residue which are nonputrescible. These waste materials make up the majority of the wastes to be landfilled. The remainder is bypass refuse which would be generated on a periodic basis. Bypass refuse may require short-term storage by WLSSD at another site or disposal at another landfill in the region.

The new landfill sections for the ash/residue would be installed with a leachate collection system, which would control future leachate, but would not necessarily reduce leachate generation in the oldest sections of the landfill.

5.7.1.5 Proposed Disposal Methods

Demolition type wastes are proposed to be taken to the Beck's Road Landfill. The quantity to be hauled is estimated at 5700 cubic yards and will be handled by the City of Duluth. The Beck's Road facility has approximately 1,000,000 cubic yards of volume remaining and an average daily inflow of 400 to 600 cubic yards (ERT, 1985).

The volume of demolition waste associated with the proposed project will not significantly impact this facility. Any asbestos wastes that are generated will be handled in accordance to best management practices for disposal at the Rice Lake facility.

Mill refuse is proposed to be sent to the WLSSD Resource Recovery Facility (incinerator). The WLSSD currently accepts roughly 75,000 tons per year from the local municipalities. The 2400 tons/year of refuse expected from the papermill represents a 3% increase over current disposal rates at the facility.

The disposal method for the power plant ash waste stream has not been finalized, but the Rice Lake Landfill has been proposed as the disposal site. The results of the EP and ASTM leaching tests on similar wastes streams suggest that the bottom ash may be compatible for co-disposal with municipal waste currently being hauled to the Rice Lake Facility, but additional analytical data and MPCA approval is required. This waste stream represents the largest fraction of waste to be generated by the proposed project, at roughly 7600 tons/year.

Wastewater treatment plant effluent from the papermill is proposed to be sent to the WLSSD WWTP for further treatment. The WLSSD WWTP runs a primary and secondary process using biological, activated sludge techniques. The sludge generated by these processes is then incinerated at the Resource Recovery Facility. It is estimated that the quantity of solids (sludge) generated at WLSSD and attributable to the papermill is 7000 tons/year (dry weight). Since this sludge is roughly 60% clay (unburnable), this would result in approximately 4200 tons/year of solids to be landfilled at the Rice Lake Landfill.

An estimate of the quantity of scrap material on the site (scrapyard) has not been made. Recoverable scrap will be sold and the remainder will be landfilled. The cleanup of contaminated soil or waste materials is discussed in the following section.

Figure 5.7-1 provides a summary of the origin and destination for all wastes generated by the proposed papermill. Table 5.7-4 shows the total volume of wastes to be landfilled (final disposal method). Approximately 5700 CY of demolition wastes will go to the Beck's Road Landfill on a one time basis, while an annual volume of approximately 16,200 CY of ash and residual waste will be landfilled primarily at the WLSSD's Rice Lake facility.

5.7.1.6 Proposed Hazardous Waste Cleanup

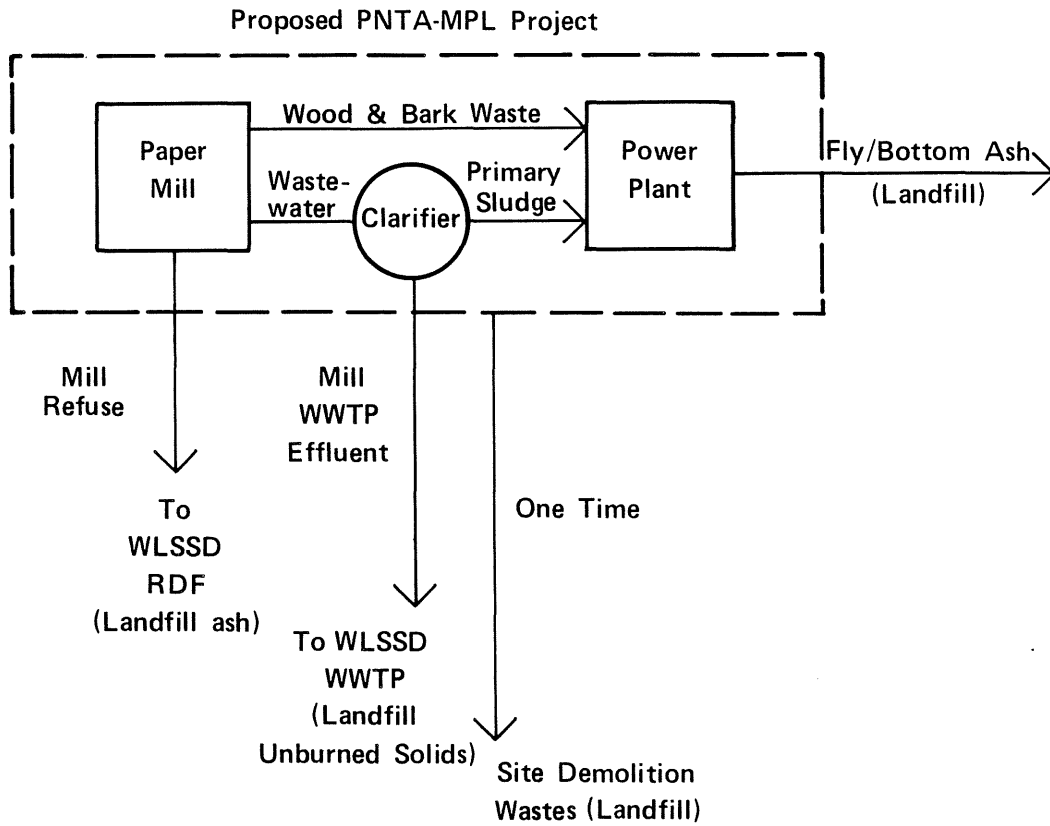
In order to prepare the site for the proposed action, the scrap materials from the site must be removed from the area and the extent and source of contamination from hazardous waste fully determined. A remediation investigation and feasibility study (RI/FS) will be performed on the site by the Lake Superior Paper Company after the scrap has been removed (Pulford, 1985). Quality assurance and health and safety plans will be prepared as part of this effort. Extensive surface and ground water, soil, and sediment samples will be taken and analyzed. The MPCA has already developed a Hazard Ranking System (HRS) score of 11 for this site and proposed to include the site on the Permanent List of Priorities (PLP).

The results of the RI/FS will include an analysis of potential remedial actions to determine the environmental, technical, and economic feasibility of each option. Feasible alternatives will undergo detailed evaluation to provide the information necessary to undertake the final design and implementation of remedial action, the development and implementation of these plans will be subject to approval by the MPCA.

Groundwater contamination with volatile organic carbons (VOCs) has been identified in samples taken from wells on the Jeno's Chun King property. This problem has been addressed in a proposed remedial action plan submitted to the MPCA on December 26, 1985. The plan proposes that extensive groundwater monitoring be conducted to determine the level and extent of contamination and that a purge well(s) be constructed to extract contaminated groundwater whereupon it would be conveyed to the WLSSD treatment plant.

5.7.1.7 Summary

Beneficial impacts of the proposed action will include the utilization of the bark, wood chips, wastewater treatment sludge, and trash from the mill to generate energy. This energy recovery would have a secondary beneficial impact of an overall reduction of waste volume requiring landfilling. The future cleanup of the Union compressed scrapyard and the pumping and treatment of contaminated groundwater at the Chun King site would be a major improvement to the area. Not only would the aesthetics be greatly enhanced, but a serious source of uncontrolled hazardous materials would be properly remedied.



**Overview of Waste Streams
From the Project**

Figure 5.7-1

Table 5.7-4. Annual Solid Waste to Landfill

Type	Disposal	Weight (Tons)	Volume (C.Y.) ^a
Demolition	Beck's Road Landfill		5,700 (one time)
Ash	Rice Lake Landfill	7,600	9,600
Mill trash	Rice Lake Landfill	720 (rejects)	900
		120 (by-pass)	240
		<u>180 (Ash)</u>	<u>225</u>
		1,020	1,365
WWTP solids	Rice Lake Landfill	<u>4,200</u>	<u>5,250</u>
	Total	12,820	16,215 ^b

Source: Adopted from ERT, 1985.

- a. Ash and rejects density of 1600 pound/CY and bypass density at 1000 pounds/CY (compacted).
- b. Does not include one-time demolition waste to Beck's Road Landfill.

Anticipated adverse impacts of the proposed action are as follows:

- o Land surfaces not currently covered with residue/ash/bypass trash will be covered with wastes, thus eliminating any existing wildlife or vegetation; the proposed Rice Lake Landfill area is, however, already highly disturbed.
- o Leachate generation will increase as a result of the long-term landfill operation, along with the potential risk to local water resources.
- o Use of the landfill area for waste disposal will eliminate the possibility of using the land for other purposes in the near future.
- o Landfill operations will increase the noise, dust, and odor over ambient levels.
- o Truck traffic over the roads to the landfill will increase, along with the potential for accidental spills on the road.

5.7.2 Impacts of the Fully Permitted Action

In the fully permitted action, the Hibbard Station will operate at 100 percent capacity to supply excess power to the Minnesota Power System. This will be achieved by burning additional fuel, including some distillate fuel oil which produces no measurable ash. The only difference between solid waste impacts of the proposed action and the fully permitted action is the rate of ash generation from the power plant. Ash generation at the fully permitted level will increase greatly over the rate of ash generation for the proposed action.

5.7.3 Mitigation

The potential environmental impacts of the waste generated by the project revolve around the proposed landfill disposal method. Increased truck traffic to the landfill, potential leachate production, fugitive dust, disturbance to the local ecology, and removal of the landfill from other beneficial land uses during and after landfilling are the primary concerns.

Mitigative measures proposed to lessen the impact of the proposed action include the following:

- o Trucks hauling waste from the site and to the landfill will be limited to operations during the daylight hours (9:00 A.M. to 4:00 P.M. week days) when noise and traffic levels are already elevated
- o Testing of the waste prior to landfilling will be performed to ensure that the proper disposal method (i.e. separate cell or co-disposal) will be used
- o Waste materials at the landfill will be covered on a daily basis with suitable material to limit the inflow of precipitation, lessen odor, and decrease windborne paper

- o The landfill will be operated under management practices that ensure proper compaction, cover, and grading of the landfill cells in compliance with the MPCA permit conditions
- o Leachate collection and treatment will be employed to detect and correct any leachate problems
- o The working area of the landfill will be limited to minimize disturbance to vegetation and wildlife on the site
- o Accidents involving the release of wastes to the roadways will be minimized by using trucks in good condition, trained drivers, and an active safety program as well as an emergency response plan
- o Final grading of the site will be performed in accordance to permit plans to provide natural contours that blend with surrounding land uses and allow the completed landfill to be used as parkland or for light structures. The mitigative measures for the fully permitted action would be identical to those of the proposed action.

5.7.4 No Action Alternative

Under the no action scenario, no papermill would be built and the Hibbard Station would remain as is. Solid waste generation and landfilling would continue to rise at their present rates. No benefits would be derived from the recycling of wastes to produce power.

A major consideration would be the continued existence of uncontrolled hazardous waste and contaminated groundwater on the site. Without the proposed action, there is less incentive to rapidly take the necessary corrective actions to immediately remedy this problem.

5.7 References

Environmental Research & Technology, Inc., Duluth Paper Mill-Solid Waste, P-D 864-700, Prepared for PNTA-MPL, Concord, MA.

ERT, See Environmental Research & Technology, Inc.

5.8 ECOLOGY

The terrestrial and aquatic ecological impacts associated with the project are addressed in this section. The impact analysis was based upon the project description and ecological baseline conditions as well as environmental objectives and laws. Appropriate mitigation measures are also described.

5.8.1 Terrestrial Impacts of the Proposed Action

Construction of the project would permanently remove small acreages of relatively undisturbed, natural vegetation as indicated below:

- o Spring surge wood storage--2.8 acres of wetland areas
- o Machine and stock preparation--1.8 acres of deciduous forests
- o Woodyard and chip storage--8.4 acres of open fields (ERT, 1985)

These acreages represent 25, 36, and 34 percent of the wetland areas, deciduous forests, and open fields found on the site. The loss of the above acreage is considered to be of minor significance because of the relatively small areas involved.

All other disturbance resulting from plant construction would occur in industrial and residential areas. The only other wetland area located at the site (approximately 5.7 acres along the northeastern boundary) would not be affected by plant construction (ERT, 1985).

The predominant wildlife groups associated with onsite wetland areas, deciduous forests, and open fields would be waterfowl, songbirds, and small mammals. Construction of the project would result in the loss of less mobile animals (e.g., a number of small mammals) and the displacement of others (e.g., waterfowl and songbirds) to nearby suitable habitat. The success of displaced species would depend on whether the areas into which they moved were at or below carrying capacity. Construction noise and direct human disturbance would also impact wildlife. Such impacts would not be expected to be significant in light of the limited habitat available in the area; also no unique nor critical habitats would be disturbed.

Operational impacts of the project would largely be related to possible disturbance of wildlife by noise. Animals present would either move from the area or adjust to plant noise levels, depending on their sensitivity to such disturbance.

Retrofitting and operation of the Hibbard Station should not directly impact the ring-billed gull colony nesting on the peninsula east of the station because construction activities would not occur on the peninsula itself. Indirect disturbance, such as noise, would probably not cause the colony to move since construction of a major bridge just north of the Hibbard Station did not result in the ring-billed gulls abandoning the peninsula (Pfammuller, 1985). However, direct interference by plant personnel could cause disturbance. If such disturbance resulted in the colony nesting elsewhere, the potential exists for the common tern or piping plover to be adversely affected. Impacts to the latter species would result from gulls

using nesting sites which terns or plovers might otherwise occupy, since gulls arrive about two weeks earlier (Pfannmuller, 1985).

Indirect operational impacts of the Hibbard Station could include SO₂ effects on vegetation. The proposed action would result in a maximum annual concentration of 1.4 $\mu\text{g}/\text{m}^3$ SO₂ for areas below stack top and 17.4 $\mu\text{g}/\text{m}^3$ SO₂ for areas above stack top. The background levels in the Duluth area are 18.3 $\mu\text{g}/\text{m}^3$. These predicted SO₂ concentrations are considered to be below the level at which either visible injury or decreases in growth and production may occur for sensitive woody vegetation; thus, impacts would not be expected (ERT, 1985).

5.8.2 Terrestrial Impacts of the Fully Permitted Action

If the fully permitted action leads to establishing a rail system to the Hibbard Station for coal delivery, it is possible that the peninsula on which the ring-billed gulls nest could be disturbed. Track and operating rail equipment could cause the gulls to nest elsewhere; this could in turn lead to potential impacts on common tern and piping plover nesting in the area. All other potential impacts would be similar to the proposed action.

5.8.3 Mitigation of Terrestrial Impacts

Although some wetland areas, deciduous forests, and open fields will be lost, the proposed project also offers the opportunity to affect in a positive manner those natural areas that remain. Undisturbed wetland areas will likely be cleaned up and, since access will be limited, they should remain relatively undisturbed. Revegetation of the site also offers the opportunity to plant those species that are most beneficial to wildlife, especially songbirds. Consultation with nongame specialists within the Minnesota Division of Wildlife should be undertaken so that the greatest possible benefits can be achieved.

Direct human disturbance to the ring-billed gull colony on the peninsula east of the Hibbard Station should be avoided during the nesting season. Limiting access by placing a fence at the western end of the peninsula would prevent such disturbance.

Mitigation measures for the proposed action would also apply to the fully permitted action. If the peninsula east of the Hibbard Station were used as part of the rail-coal delivery system little could be done to mitigate resulting impacts to the gull colony. Limiting development at the eastern end of the peninsula may permit some nesting, thereby lessening possible impacts on the common tern and piping plover.

5.8.4 Aquatic Impacts of the Proposed Action

The types of impacts that would directly affect aquatic resources under the proposed action include:

- o Entrainment and impingement losses of eggs; larvae; juvenile, and adult fish; macroinvertebrates; and plankton due to water withdrawal from St. Louis Bay and entrapment at the intake screens

- o Altered water quality due to effluent discharge or runoff from the site

5.8.4.1 Entrainment and Impingement

Operation of the project will require a withdrawal of four million gallons of water per day (mgd) from St. Louis Bay via the existing intake structure at the Hibbard Station (ERT, 1985). The intake structure is composed of trash racks which prevent large objects from entering the intake structure. Screens keep out smaller organisms and sand. However, organisms that can pass through the mesh of the screens, such as fish eggs and larvae, macro-invertebrates and plankton, are susceptible to entrainment. Fish eggs and larvae are considered to be the most important aquatic resources in terms of their direct value to man.

Based on entrainment studies conducted at the Hibbard Station in 1975, the major impacted organisms were unidentified eggs in May, rainbow smelt in May, walleye in June, black bullhead in July; white sucker in June, and yellow perch during May through July (Table 5.8-1) (Minnesota Power and Light Company, 1977). Using these same numbers, predicted entrainment densities of fish eggs and larvae for the proposed action were estimated by multiplying the densities with the proposed volume of intake water (Table 5.8-2). Overall, the estimates indicated a 98% decrease of entrained fish eggs and larvae compared to the 1975 levels.

Plankton are considered important in that they represent a vital link in the food chain supporting the early life stages of fish. With respect to macro-invertebrates and zooplankton, entrainment studies conducted in 1975 indicated that low to moderate numbers of macrocrustaceans (e.g., Gammarus sp.), dipterans, cladocerans, and copepods were entrained (ERT, 1985). Diatoms, green algae, and blue-green algae were the predominately entrained phytoplankton. These entrainment losses are not considered to be significant because of the dynamic reproductive capabilities of the organisms that would quickly compensate for the reductions.

Fish impingement, which is the process of pinning larger entrapped species to a barrier, is expected to be inconsequential (ERT, 1985). The withdrawal of 4 mg of water per day creating approach velocities of less than 0.1 foot per second (fps) is well below the recommended velocities of 0.5 to 1.0 fps to minimize fish impingement (ASCE, 1982).

5.8.4.2 Water Quality

Surface or stormwater runoff from the project site will enter Keene Creek and St. Louis Bay. No adverse water quality changes are expected (see Section 5.2). Therefore, aquatic communities in Keene Creek or St. Louis Bay are not expected to be impacted by surface or stormwater runoff.

Wastewater from the site will be discharged into existing sanitary sewers to the Western Lake Superior Sanitary District (WLSSD), which will eventually be discharged into St. Louis Bay. The WLSSD indicated that they will be able to handle the additional loadings created by the project, and since they are under NPDES permit requirements, the water discharged into St.

Table 5.8-1. Estimated Entrainment Densities of Eggs and Larvae
at the Hibbard Station (1975)

Taxa Collected	Daily Entrainment Densities (No./day ^a) During 1975					
	Apr	May	Jun	Jul	Aug	Oct
Unidentified eggs	710	484,900	0	0	0	0
<u>Larvae</u>						
Alewife	0	2700	0	0	0	0
Black bullhead	0	0	0	7300	440	0
Bluegill	0	0	0	0	0	2700
Emerald shiner	0	0	90	90	0	0
Rainbow smelt	0	251,400	10,300	90	0	5300
Spottail shiner	0	90	0	180	0	0
Troutperch	0	0	0	0	90	0
Walleye	0	21,500	407,800	15,400	90	0
White sucker	0	0	191,100	13,500	620	0
Yellow perch	0	1,615,100	10,386,400	200,900	2700	0

Source: NUS derived from 1975 densifies (No/1000m³) (ERT, 1985) and
intake water volume (ERT, 1985).

Table 5.8-2. Estimated Entrainment Densities of Eggs and Larvae at the Hibbard Station Under the Proposed Action

Taxa Collected	Estimated Daily Entrainment Densities (No./Day) ^a					
	Apr	May	Jun	Jul	Aug	Oct
Unidentified eggs	12	8,300	0	0	0	0
<u>Larvae</u>						
Alewife	0	50	0	0	0	0
Black bullhead	0	0	0	120	8	
Bluegill	0	0	0	0	0	50
Emerald shiner	0	0	<1	<1	0	0
Rainbow smelt	0	4,300	200	1	0	90
Spottail shiner	0	<1	0	3	0	0
Troutperch	0	0	0	0	1	0
Walleye	0	370	7,000	300	1	0
White sucker	0	0	3,000	200	10	0
Yellow perch	0	28,000	180,000	3,000	50	0

Source: MPL, 1977 (Entrainment/impingement studies conducted in 1975).

- a. Daily entrainment estimates were calculated by multiplying the 1975 densities (No./1000 m³) times the proposed volume of intake water (15,140 m³).

Louis Bay is not expected to change in quality (ERT, 1985). Therefore, Table 5.8-1 aquatic communities in St. Louis Bay are not expected to be impacted by wastewater effluent from the plant.

5.8.5 Aquatic Impacts of the Fully Permitted Action

The types of impacts that would directly affect aquatic resources under the fully permitted action are much the same as for the proposed action except for the withdrawal of 45 times as much water and the addition of thermal discharges.

5.8.5.1 Entrainment and Impingement

Operation of the fully permitted action will require withdrawal of 181 million gallons of water per day from St. Louis Bay via the Hibbard Station intake structure (ERT, 1985). The intake structure would be similar to that described above except for the opening and enlarging of two more existing forebays (ERT, 1985).

Predicted entrainment densities of fish eggs and larvae for the fully permitted action plan were estimated by multiplying the densities obtained in the 1975 entrainment study (Table 5.8-1) with the proposed volume of intake water (Table 5.8-3) (ERT, 1985). The predicted estimates revealed major impacted organisms to include unidentified eggs during April through May, alewife in May, black bullhead during July through August, bluegill in October, rainbow smelt during May through June, spottail shiner in July, walleye during May through July, white sucker during June through August, and yellow perch during May through August. Overall, the estimates for the fully permitted action predict a 22 percent decrease of entrained fish eggs and larvae compared to the levels in 1975. It will also affect a wider range of species compared to the proposed action. Of those species that are valued as being major game fish, walleye and yellow perch will be affected the most. Compared to the proposed action, the duration of the impacts under the fully permitted action will increase. The loss of fish larvae would result in the reduction of the adult fish populations; the extent of this loss is uncertain since there are limited data on the population dynamics of these species in the St. Louis River (ERT, 1985). However, the loss would be significantly greater under the fully permitted action plan compared to the proposed action.

The fully permitted action would create approach velocities of 0.95 fps (ERT, 1985). This is within the recommended velocities of 0.5 to 1.0 fps to minimize fish impingement (ASCE, 1982). Based on impingement studies conducted at the Hibbard Station in 1975, the dominant species removed from the intake screens and trash racks (greater than 10 percent of the total catch) included black bullhead, rainbow smelt, and yellow perch (Table 5.8-4). The impingement numbers presented in Table 5.8-4 represent losses at an intake approach velocity of 4.5 fps; however, due to a much lower approach velocity, the impingement losses are not expected to be as great (ERT, 1985).

Table 5.8-3. Estimated Entrainment Densities of Eggs and Larvae at the Hibbard Station under the Fully Permitted Action

Taxa Collected	Estimated Daily Entrainment Densities (No./Day) ^a					
	Apr	May	Jun	Jul	Aug	Oct
Unidentified eggs	550	377,000	0	0	0	0
Larvae						
Alewife	0	2,000	0	0	0	0
Black bullhead	0	0	0	6,000	340	0
Bluegill	0	0	0	0	0	2,000
Emerald shiner	0	0	<70	<70	0	0
Rainbow smelt	0	195,000	8,000	70	0	
Spottail shiner	0	<70	0	2,000	0	0
Troutperch	0	0	0	0	70	0
Walleye	0	17,000	317,000	12,000	70	0
White sucker	0	0	148,000	11,000	500	0
Yellow perch	0	1,255,000	8,070,000	156,000	2,000	0

Source: MPL, 1977 (Entrainment/impingement studies conducted in 1975).

- a. Daily entrainment estimates were calculated by multiplying the 1975 densities (No./1000 m³) times the proposed volume of intake water (688,113 m³).

Table 5.8-4. Total Numbers and Weights of Fish Impinged by the Hibbard Station During 1975

Taxa Collected	No.	%	Wt.	%	No./ Impinged 24 Hour	Wt./ Impinged 24 Hour
Alewife	4	<.01	11.0	0.1	<0.1	0.1
Black bullhead	2440	23.3	7,506.5	31.1	29.4	91.4
Brown bullhead	1	<0.1	5.5	<0.1	<0.1	<0.1
Burbot	114	1.1	248.5	1.0	1.4	3.0
Carp	6	<0.1	3.5	<0.1	<0.1	<0.1
Central mudminnow	1	<0.1	0.5	<0.1	<0.1	<0.1
Cisco	3	<0.1	34.0	<0.1	<0.1	0.4
Emerald shiner	1	<0.1	0.5	<0.1	<0.1	<0.1
Golden shiner	1	<0.1	0.5	<0.1	<0.1	<0.1
Longnose sucker	28	0.3	619.8	2.6	0.3	7.5
Northern creek chub	2	<0.1	0.0	0	<0.1	0
Northern pike	59	0.6	939.0	3.9	0.7	11.3
Northern redhorse	2	<0.1	20.0	0.1	<0.1	0.2
Rainbow smelt	5,375	51.3	6,281.9	26.0	64.7	75.7
Rock bass	2	<0.1	2	<0.1	<0.1	<0.1
Spottail shiner	81	0.8	40.0	0.2	1.0	0.5
Tadpole madtom	4	<0.1	4	<0.1	<0.1	<0.1
Troutperch	236	2.3	243.7	1.0	2.8	2.9
Walleye	134	1.3	627.5	2.6	1.6	7.6
White sucker	135	1.3	2,380.0	9.8	1.6	28.7
Yellow bullhead	4	<0.1	8.0	<0.1	<0.1	<0.1
Yellow perch	1,826	17.4	5,176.5	21.4	22.0	62.3
	<u>10,459</u>		<u>24,152.9</u>		<u>126.0</u>	<u>292.0</u>

Source: Bioecological Consultants, Inc., 1977.

5.8.5.2 Water Quality

Installation of support structures and/or granular fill for the alternative steamline in the north bay would disturb benthic macroinvertebrate habitats and fish spawning grounds as well as increase turbidity in the water, which would affect fish eggs and sessile benthic macroinvertebrates. However, the impacts are not expected to be critical since there are no known game fish spawning grounds in the vicinity (ERT, 1985). Necessary permits from the MDNR, Corps of Engineers, and U.S. Coast Guard would ensure minimal disruption to the aquatic environment (Lindholm, 1985).

The fully permitted action involves discharge of 177.8 mgd of heated open-cycle cooling water in the north bay (ERT, 1985). The expected discharge flow rate and increase in ambient temperature are presented in Table 5.8-5. Characteristics of this thermal plume were determined for typical summer conditions and typical fall conditions. The results of the thermal load are indicated in Figures 5.8-1 and 5.8-2.

Table 5.8-5. Characteristics of Cooling Water Discharge:
Fully Permitted Condition at the Hibbard Station

Unit	Discharge Flow Rate (gpm)	ΔT (°C)
1	39,000	6.7
2	44,100	5.6
3	40,375	7.2
4	--	--
Total or weighted average	123,475	6.4

Source: ERT, 1985.

Thermal impacts to aquatic organisms are dependent upon the species, life-stage, time of the year, and the amount of change in the temperature compared to their acclimated temperature. Thermal impacts were determined only for yellow perch and walleye since these species are considered to be major game fish in the area. Bennett (1965) determined the maximum and minimum lethal temperatures for yellow perch for several acclimation temperatures (Table 5.8-6). Black (1953) found that 100 percent mortality occurred between 29.1-29.8°C, when fish were acclimated at 22-24°C. Assuming that the acclimation temperature is equivalent to the natural water temperature, 21.8°C in July and 6.6°C in October, a 7.2 degree increase in water temperature due to thermal discharge in July (Figure 5.8-1) would result in an ambient temperature of 29.0°C. The estimated maximum lethal temperature for an acclimation temperature of 21.8°C would be 28.9°C. Since the temperature due to thermal discharge (29.0°C) is greater than the maximum lethal temperature (28.9°C), adverse impacts such as inhibition of spawning, reduced growth, and some mortality may occur to yellow perch. A 7.8°C increase in water temperature in July (Figure 5.8-1) would result in an ambient temperature of 29.6°C. According to Black's results, this would induce 100 percent mortality in yellow perch. However, in either case, the yellow perch are

more likely to avoid the area. Storr and Schlenker (1974) found that if temperatures reach 25°C in a thermal plume, the perch tend to avoid the area. Thus, according to temperature changes in Figure 5.8-1, the north bay, and part of the south bay during the summer months, would most likely be devoid of yellow perch.

Table 5.8-6. Maximum and Minimum Lethal Temperatures of Yellow Perch at Several Acclimation Temperatures

Acclimation Temperature (°C)	Maximum Lethal Temperature (°C)	Minimum Lethal Temperature (°C)
5	21.3	
10	25.0	1.1
15	27.7	
25	29.7	3.7

Source: Bennett, 1965.

During the cooler months, a 9.5°C increase in water temperature due to thermal discharge (Figure 5.8-2) would result in a ambient temperature of 16.1°C. The maximum lethal temperature for an acclimation temperature of 5°C is 21.3°C (Table 5.8-6). Thus thermal discharge during the cooler months will have no impact on yellow perch.

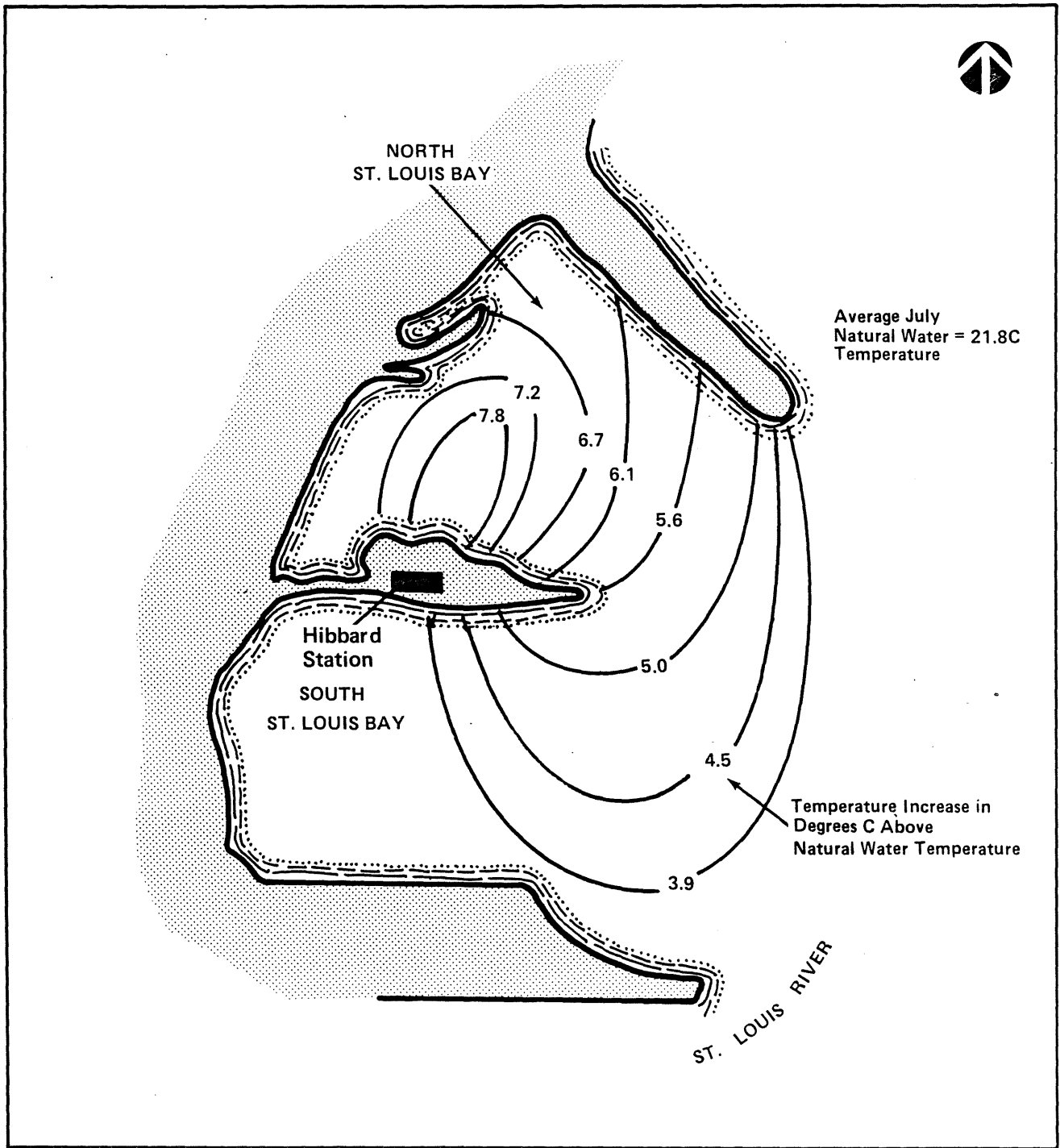
Goodson (1966) and Trembly (1960) determined the TL50 values for walleye exposed to five acclimation temperatures (Table 5.8-7). The TL50 indicates the temperature at which 50 percent mortality occurs in the tested population. As calculated above, an increase in water temperature of 7.8°C in July (Figure 5.8-1) and 9.5°C in October (Figure 5.8-2) would result in an ambient temperature of 29.6°C and 16.1°C, respectively. Thus, the TL50's for acclimation temperatures of 21.1°C and 7.5°C are 33.4°C and 29.0°C, respectively. Since the temperatures due to thermal discharge (29.6°C and 16.1°C) for both cases are less than the TL50's (33.4°C and 29.0°C), no adverse impacts to walleye are expected.

Table 5.8-7. Relation Between Acclimation Temperature and TL50 for the Yellow Walleye

Acclimation Temperature (°C)	7.5	10.0	15.6	21.1	29.4
TL50 (°C)	29.0	29.4	31.1	33.4	36.7

Source: Trembly, 1960; Goodson, 1966.

Fish eggs and larvae that may reside in the bays during the summer months may be more susceptible to temperature changes than the young of the year and adult fish. The extent of susceptibility is unknown due to the lack of literature on their sensitivity to thermal impacts.

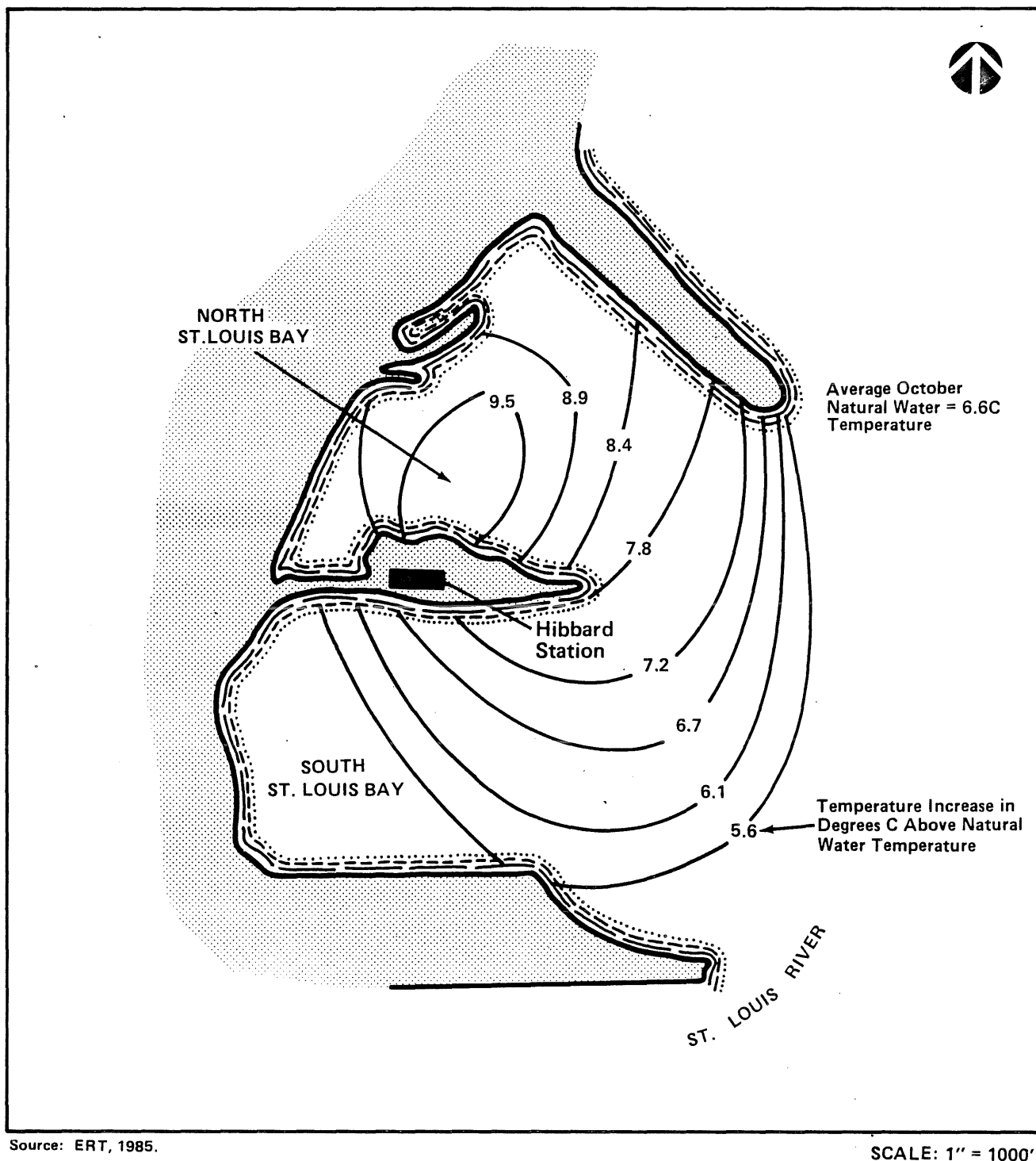


Source: ERT, 1985.

SCALE: 1" = 1000'

**Predicted Surface ΔT Isotherms
During July: Fully Permitted Condition
Hibbard Station**

Figure 5.8-1



Predicted Surface ΔT Isotherms During
October: Fully Permitted Condition
Hibbard Station

Figure 5.8-2

5.8.6 Mitigation of Aquatic Impacts

It is expected that the entrainment and impingement losses under the proposed action will be minimal and will not require mitigation measures (ERT, 1985). The consequence of entrainment and impingement impacts on the fish population under the fully permitted action is uncertain without the population dynamics data on the fish species that occur in the St. Louis River. Therefore, it is recommended that a monitoring survey be conducted to estimate and verify entrainment and impingement losses of fish. If the survey indicates a significant loss of fish species, particularly game fish, then the following options are suggested to minimize impacts:

- o Smaller mesh size on the traveling screens to reduce entrainment of fish eggs and larvae
- o More frequent backwashing of the travelling screens to reduce impingement of fish
- o Larger screen surface area to reduce intake velocities
- o Reduce volume of water withdrawal during the months of May through August when larvae and eggs are most abundant
- o Block nets placed in front of intake forebay to reduce impingement of fish

Thermal impacts are not likely to be a problem for walleye under the fully permitted action but may affect yellow perch, during the summer months. Fish eggs and larvae may also be subjected to thermal impacts during the summer months. It is recommended that a fish population survey be conducted to estimate and verify population fluctuations in the bay areas. If the fish population survey indicates a significant reduction in the use of the bay areas by the fish or an increase in fish mortality, then it is suggested that mitigative action take place.

5.8.7 No Action Alternative

Under the no action alternative, ecological conditions at the site would remain unchanged (ERT, 1985). Therefore, no adverse impacts would affect aquatic resources. However, terrestrial resources may be adversely impacted by continued promiscuous dumping in existing natural areas.

5.8 References

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5.9 ECONOMIC AND SOCIAL CONDITIONS

The impacts of the proposed action, impacts of the fully permitted action, and the no action alternative of the project are presented in this section. Each option is analyzed in terms of potential changes in or demands on existing, baseline conditions. These changes would result largely from population or employment changes.

5.9.1 Impacts of the Proposed Action

The effects of the proposed project on the economic and social conditions in the Duluth area are assessed in this section. The subjects covered include population, economy, housing, and community services and facilities.

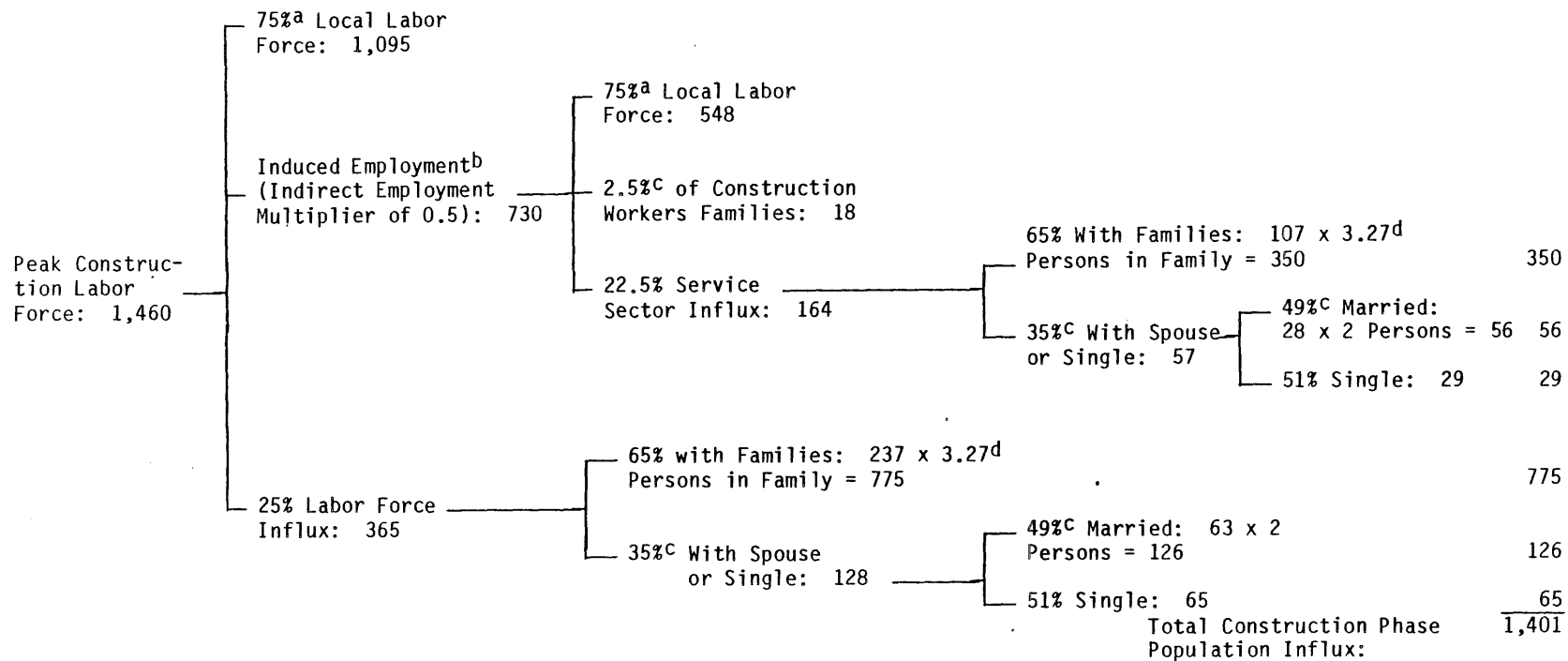
5.9.1.1 Population

Population influx associated with the proposed project would result from some of the required construction and operation workers moving into the study area. It is expected that most of the required workers will be obtained from the local labor pool, however, as unemployment (and possibly underemployment) of workers is quite high in the region. The local labor pool includes workers in the four-county secondary study area which consists of St. Louis, Carlton, and Lake Counties, Minnesota and Douglas County, Wisconsin. As population and business expand in the area as a result of the project, an additional number of workers and their families may be expected to move to the area to staff the additional job opportunities that would be generated. Most of these positions would be expected to be available in the service sector of the local economy.

Construction employment for the project would total 1,460 at the peak of the 24 month schedule, which is expected to begin in May, 1986. Permanent employment positions are projected to include approximately 300 positions, beginning in December, 1987 when operation would begin. Therefore, the peak construction employee requirement will be 1,460 workers during the fourteenth month of construction. The operation phase employee requirement will remain constant at 300 workers by about the twentieth month after construction begins.

The methodology used to assess the construction phase employment impact on population has been described in diagrammatic form in Figure 5.9-1. The peak construction labor force is divided into those workers who are likely to come from the local labor force and those who will relocate from outside the local labor force. Research focused on the original residence of construction workers at 22 large energy-related construction project sites indicates that an average of 45 percent of construction workers moved to the site. However, at project sites near metropolitan areas, the average percentage of construction workers moving to the site was only 25 percent. At these sites, an average of 35 percent of the workers moving to the site were without families while 65 percent came with families. According to these 1975 surveys, the average family size of non-local construction workers was about 3.56 persons. The 1980 U.S. average of 3.27 persons per family was used in this analysis, as there has been a decline in the average U.S. family size between 1970 (3.57 persons) and 1980 (3.27 persons), according to the Bureau of the Census.

Figure 5.9-1. Estimated Peak Population Influx During the Construction Phase of the Project



a. From metropolitan data, Mountain West Research, 1975.

b. Preliminary estimate of multiplier from University of Minnesota at Duluth, School of Business and Economics.

c. As reported in: Mountain West Research, 1975.

d. The average U.S. family size in 1980 according to: U.S. Department of Commerce, Bureau of the Census, 1982a.

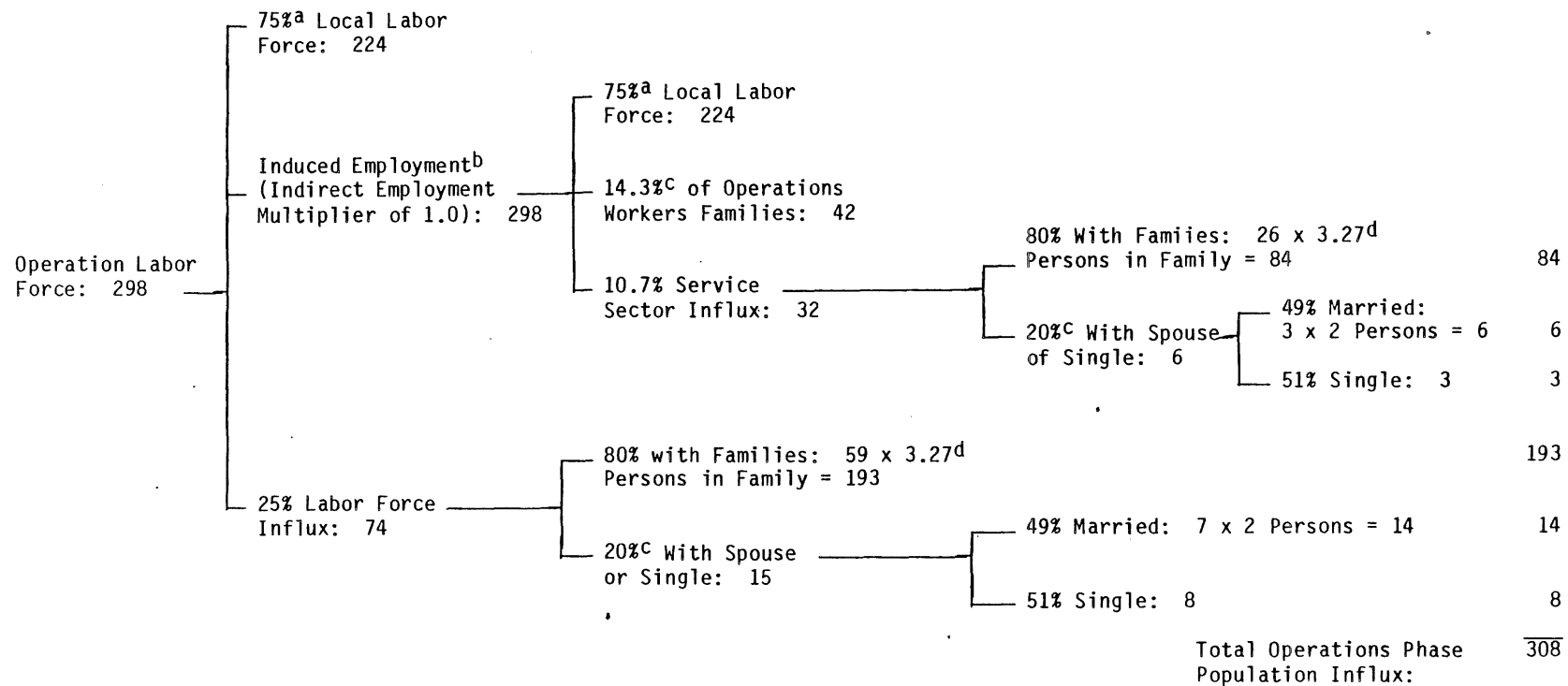
The service sector employment and population increase that would result from proposed project construction employment has been determined in a manner similar to the primary construction employment calculations. The induced service sector employment is determined by multiplying the peak construction labor force by a multiplier appropriate for the region. The percentage of this induced service sector employment filled by the local labor force and by members of construction worker families, as well as the percentage of service workers with or without families, have been calculated and displayed in Figure 5.9-1. The results of the methodology, as shown in Figure 5.9-1, indicate that the peak construction phase population influx is expected to be 1401 persons. This figure includes 966 construction workers and their family members and 435 service sector employees and their families.

The same methodology used for the construction phase was used to assess the potential operation phase employment impact on area population. The results of this methodology are presented in diagrammatic form in Figure 5.9-2. Based on the types of occupations required for the operation labor force and the local employment conditions, it is assumed that the large majority of operation employees would be from the local labor force of Duluth and Superior, although some workers would commute from the surrounding four-county area. The induced service sector employment would also be composed primarily of local workers. As shown in Figure 5.9-2, the results of the assessment indicate that 308 people will move into the secondary study area. Most of the influx, 215 persons, would result from the project workers who move to the area and their families. The remaining 93 new residents would be the result of the service sector labor force influx.

A summary of population impacts resulting from the construction and operation phases of the proposed project is presented in Table 5.9-1. It is estimated that approximately 60 percent of the relocating workers would settle in Duluth and about 30 percent would reside in Superior, based on the projected site location in West Duluth. It is not expected that this population influx would cause any negative impacts to occur in the area, as it has been estimated that large population losses have occurred in the past five years. An estimated loss of about 6400 persons from Duluth and about 1900 persons from Superior has taken place between 1980 and 1985. Therefore, an influx of 841 people into Duluth and 420 into Superior during the construction phase of the project would serve to replace some of the estimated population loss of recent years, although not all of these workers and family members would be expected to become permanent residents. During the operation phase of the proposed project, approximately 185 individuals are expected to locate in Duluth and 92 people would settle in Superior.

Population characteristics of the construction worker newcomers and service sector newcomers are compared to those of the 1980 population of Duluth and Superior in Table 5.9-2. The median age of the newcomers would be expected to be significantly younger than the median age of the local population. Household sizes of the two newcomer groups would probably be larger than that of the 1980 household sizes in the local communities. It is likely that a lower proportion of newcomers will have graduated from high school, based on the 1975 data shown in Table 5.9-2.

Figure 5-9.2. Estimated Population Influx During the Operation Phase of the Project



- a. Assumption based on local economic conditions in Duluth and region, as discussed in Section 3.2 and 3.3
 b. Preliminary estimate of multiplier from University of Minnesota at Duluth, School of Business and Economics.
 c. As reported in: Mountain West Research, 1975.
 d. The average U.S. family size in 1980 according to: U.S. Department of Commerce, 1982a.

Table 5.9-1. Summary of Construction and Operation Population
Influx Estimates as a Result of the Project

	Construction Phase	Operation Phase
Population influx		
Total	1,401	308
Induced employment	435	93
Distribution ^a		
Duluth	841	185
Superior	420	92
Worker influx		
Total	547	148
Induced employment	182	74
Family influx		
Total	529	106
Induced employment	164	32
Distribution		
Duluth	317	64
Superior	159	32

Source: Calculations performed, as diagrammed in Figures 2-2 and 2-3.

- a. Estimated distribution of the population that will move to the area:
Duluth, 60 percent; Superior, 30 percent; other towns, 10 percent.

Table 5.9-2. Population Characteristics for Duluth, Superior,
and Projected Newcomer Employees

	Newcomer Construction Workers	Other Newcomers	Duluth	Superior
Median Age	22.5	21.9	30.0	30.1
Household size				
Persons/household	2.7	2.8	2.5	2.5
Educational attainment				
Percentage of high school Graduates	45.5	32.4	72.5	69.5

Source: Mountain West Research, 1975.
U.S. Department of Commerce, 1983.

5.9.1.2 Economy

The construction of the project in West Duluth would cause several favorable economic impacts in the City of Duluth and in the northeastern Minnesota region. Direct employment benefits would include the formation of an estimated peak of 1460 construction jobs that would be filled during the 24-month construction period. About 300 employment positions would be required for project operation, creating approximately 135 jobs in the logging industry and additional jobs involved in the transportation of raw materials and final products. It is estimated that 75 percent of the papermill employment positions will be filled by the local labor force.

The addition of direct employment positions, the workers' wages and salaries, and various purchases of materials and services by the mill would all have a favorable impact on the local economy. The total estimated payroll expected to accrue through construction of the project would be \$55 million. It has been estimated that \$35 million of this cost would be for general contractor work and \$20 million would cover subcontractor work during the construction phase.

Through the direct employment, associated payroll and purchases, the project would induce secondary employment opportunities in the region. A large scale simulation model developed at the University of Minnesota, St. Paul was used to determine the impacts of the proposed project on the economy of Northeastern Minnesota. The model, called SIMLAB, traces the path of growth or decline for 75 identified industries in the region, on the basis of a large number of assumptions concerning the performances of both the national and regional economies. The SIMLAB model does not account for inflation in prices, only changes in real production.

With the projected operation of the project by 1988, operation of the SIMLAB model indicated that, by 1989, as many as 2600 permanent jobs may be added in all industries in the region and the regional economy may receive an annual boost of nearly \$180 million (in 1977 dollars). Even larger benefits to the region could occur in 1987 during construction of the project, according to the model, particularly within the construction industry (Levandowski, 1985).

The economy of northwestern Wisconsin would also be favorably affected by operation of the project. Added employment in the timber industry would include an estimated 36 jobs, and mill workers who would live in Superior, Wisconsin would benefit its local and state economy in terms of their household purchases and expenditures.

Equity funds to build the project would come from the partners, who would contribute needed capital in equal amounts and would share equally in any profits or losses arising from the mill's operation. In order to encourage development of the project by Minnesota Power and Pentair, Inc., the City of Duluth is offering the companies \$53.1 million in tax increment financing, tax credits and exemptions, and employment and training subsidies. Included in that sum is the exemption from \$9 million in state taxes and \$1.5 million in city taxes. These tax exemptions would involve forgiveness of the 5 percent state and the 1 percent city retail sales tax that would be applied to

the purchase of building materials, machinery, and equipment bought during construction of the project. These exemptions are in conformance with the "Distressed Counties" provision of the Minnesota Economic Diversification Act of 1985.

Of the remaining \$42.6 million of economic incentives, the largest would involve \$26.2 million in tax increment financing. These funds would initially be raised through the sale of tax increment revenue bonds by the City of Duluth. The bonds would be issued by the City under the provisions of the Development District Act, which was designed to stimulate economic activity in certain regions of the State. The proposed project site is located in Development District No. 6 of St. Louis County, Minnesota.

As part of this development effort, the City of Duluth would provide the funds for land acquisition and clearing (about \$2 million) and the retrofitting of two mothballed boilers at Hibbard Station (about \$26 million), and these financing costs would be recovered through the higher property taxes that would be paid after the proposed development occurs. Taxes on the property would be collected in the normal way, but the difference between the older, lower tax amount and the newer, higher amount would be put into a special fund to pay off the tax increment revenue bonds, i.e., the City's original costs for the land and property.

The current and future taxes that would be collected in the Development District are shown in Table 5.9-3. According to current district values, 1985 taxes payable were estimated to be \$993,624. With the addition of the project, by 1988 the district's taxes payable are estimated to be \$3,990,359, with the increment for payment of bonds estimated at \$2,996,735.

Other economic incentives to be offered by the City of Duluth to spur development of the project include \$5 million in enterprise zone tax credits, \$4.1 million in sewer utility revenue bonds, \$3.1 million in Community Development Block Grant money, and a \$2 million Economic Development Administration Title 1 grant. About \$1.5 million in employment and training subsidies would be offered, and these would include financial incentives for the companies to hire unemployed workers in the Duluth area. Another \$217,000 would be offered from the Duluth Water and Gas Public Improvement Fund.

These economic incentives offered by the City of Duluth, the State of Minnesota, and indirectly by the Federal government would all be aimed at stimulating the local economy in Duluth and in the surrounding region. Through receipt of property taxes, some of the initial financing costs would be recovered by Duluth. Income, sales and property tax revenues would increase in future years as the ripple effects of employees' wages and salaries are realized throughout the area. Business in the region would expand as a result of operation of the project and local governments in northeastern Minnesota, as well as the State government, would receive fiscal benefits through higher tax revenues.

Table 5.9-3. Estimated and Assessed Value and Taxes Payable of the Proposed St. Louis Bay Energy and Industrial Park (Dollars)

	Estimated Market Value	Assessed Value	Taxes Payable
<u>Current District Values</u>			
1984 Assessment			
1985 Taxes	16,578,900	5,700,000	993,624 ^a
<u>District Including Proposed Improvements</u>			
1987 Assessment			
as of 1988 Taxes	<u>56,578,900</u>	<u>22,891,000</u>	<u>3,990,359^a</u>
Captured Increment			
as of 1988 Taxes	40,000,000	17,191,000	2,996,735 ^a

Source: City of Duluth, 1985.

- a. Estimates of future tax assume current mill rate and assessment value rate of 174.32.

5.9.1.3 Housing

The proposed project would affect the supply of housing in the primary study area, especially in Duluth, in three stages. These stages correspond to the project stages of: 1) acquisition of homes and businesses on the proposed site and relocation of residents, 2) facility construction, and 3) facility operation.

The City of Duluth will be responsible for the acquisition of the 70 or more single family homes, 8 duplexes, 1 apartment building, a motel which rents out approximately 9 units as apartments and several operating business. The acquisition and relocation process would be carried out in compliance with the Federal Real Estate Acquisition and Relocation Assistance Act of 1970. This federal law must be complied with when dealing with any public taking of property, especially when federal or state funds are being utilized for compensation.

The city will contract the acquisition/relocation process to a private acquisition and relocation firm, and also to the Duluth Housing and Redevelopment Authority (HRA). The HRA is a non-governmental agency established by the Minnesota State Legislature to assist local communities in relocation processes. For the proposed project, HRA activities will involve meeting with tenants in the project area and assisting in the process of finding adequate replacement housing, by either locating a rental unit or providing downpayment assistance toward acquisition of a house.

The private acquisition and relocation firm will hold interviews with homeowners to assess their housing needs and income and to evaluate their relocation benefit needs, i.e., whether the client wishes to upgrade or downgrade future home, chooses to move to an apartment or decides to leave the area. The moving time frame would also be discussed in detail. Many residents have already expressed a desire to relocate to other parts of West Duluth if the project does take place.

Two appraisal firms would be retained as part of the acquisition/relocation process to make an independent appraisal on each housing parcel. The two appraisals per parcel would then be reviewed by a third realtor for consistency and equality to current market conditions. If the appraisals are uniform (within 10 percent), an offer would be made to the client for the affected parcel. The client has 30 days to respond to the offer. Assuming the client accepts the acquisition offer, the private acquisition and relocation firm would hold another interview with the client to discuss relocation benefits. Such benefits may include moving costs and real estate tax differences between the present and future houses. The City would pay up to \$500/year for five years for the tax differential benefit. The City may also elect to use Community Development (CD) money as a supplemental benefit for the relocated parties. Businesses on the site may also be assisted in relocating to another area.

After the acquisition and relocation benefits have been agreed to between the client and the appraisal firm, provisions would be made to move the client out of the structure. Demolition and site grading follow expeditiously once an entire block has been evacuated. The entire process, from

making appraisals to site grading, can take approximately six months. The process can be expedited on several parcels or the entire project can be divided into phases to accelerate securing the parcels that are needed first for construction activities (ERT, 1985).

The estimated number and type of additional housing units required for the construction and operation phases of the project can be determined from the expected population influx. The number of families, including each single person (considered to be a family), expected to settle in the primary study area are indicated in Table 5.9-4 for the project phases. Duluth is projected to receive 317 and 64 families as a result of the construction and operation phases, respectively. Superior is expected to receive 159 families during the construction phase and 32 families during the operation phase of the project.

The housing preferences of construction workers according to surveys in past years are as follows: single family home, 46 percent; duplex or townhouse, 1 percent; apartment, 8 percent; mobile home, 38 percent; and other housing types, 8 percent. The preferences of other newcomers were found to be single family, 70 percent; duplex or townhouse, 4 percent; apartment, 7 percent; mobile home, 17 percent; and other housing types, 1 percent (Mountain West Research, 1975). It is believed that the mobile home preference will not be as high in the Duluth area, as numerous housing units are available for rent or purchase.

Table 5.9-4 indicates the results obtained when construction worker and other newcomer housing type preferences are applied to the total number of housing units required. During construction, it is estimated that 198 single family houses, 12 duplexes or townhouses, 23 apartments, 74 mobile homes, and 10 other housing units would be demanded in Duluth, while during the operation phase, 34 single family houses, 1 duplex or townhouse, 6 apartments, and 20 mobile homes would be needed. In Superior, 99 single family homes, 4 duplexes or townhouses, 12 apartments, 38 mobile homes and 6 other housing units would be required during the construction phase. It is estimated that after construction, 17 single family houses, 3 apartments, 10 mobile homes, and 2 other housing units would be demanded in Superior. Approximately 75 existing houses are scheduled to be removed from Duluth's housing stock as a result of project construction. These units also have to be included in assessing housing impacts. The total number of housing units required in Duluth during the construction phase is projected to be 392 units, of various housing types, while in Superior, the number required would be 159 housing units.

It is expected that there would be available housing for these families and individuals, based on 1980 U.S. Census of Housing Statistics and on recent information obtained from realtors (Section 4.9). In 1980, there were 207 vacant homeowner units and 973 vacant rental units in Duluth. In Superior, there were 44 vacant homeowner units and 210 vacant rental units (U.S. Department of Commerce, 1982b). In more recent years, additional housing units of various types has become available as the population declined, including over 700 homes for sale in Duluth in December, 1985. Of these, approximately 180 were in West Duluth. Current rental vacancy rates range from over 5 percent in newer buildings to 25 percent in older buildings.

Table 5.9-4. Estimated Additional Housing Units Required in
Duluth and Superior as a Result of the Project

	Duluth			Superior		
	Construction Workers	Other Newcomers	Total	Construction Workers	Other Newcomers	Total
<u>Construction Phase</u>						
Single family	45	153	198	22	77	99
Duplex, townhouse	2	10	12	0	4	4
Apartment	7	16	23	4	8	12
Mobile home	37	37	74	19	19	38
Other	7	3	10	4	2	6
Total housing units	<u>98</u>	<u>219</u>	<u>317</u>	<u>49</u>	<u>110</u>	<u>159</u>
<u>Operation Phase</u>						
Single family	21	13	34	10	7	17
Duplex, townhouse	0	1	1	0	0	0
Apartment	4	2	6	2	1	3
Mobile home	17	3	20	8	2	10
Other	3	0	3	2	0	2
Total housing units	<u>45</u>	<u>19</u>	<u>64</u>	<u>22</u>	<u>10</u>	<u>32</u>

Source: Adapted from Mountain West Research, 1975.

Note: The estimated housing units demanded do not include replacement units for the units to be removed as part of site preparation.

5.9.1.4 Community Services and Facilities

The impact of the influx of population due to the project would have no significant impact on the present state of community services and facilities in the primary study area. The depopulation of the cities in recent years has, in many cases, left underutilized facilities, but additional staff to provide the services may be needed. Overall, the City of Duluth is expected to experience a greater influx than the City of Superior; however, the impact will be discussed in terms of both Duluth and Superior.

Both Duluth and Superior school systems are currently operating below capacity and expect enrollment to decrease. Consequently, there is adequate space available for new students, although there may be a need to hire additional teaching staff. During the construction phase, the Duluth Independent School District 709 would still be operating at an estimated 17 percent below capacity, while the School District of Superior would be operating at 15 percent below capacity, with student/teacher ratios of 23 and 20 respectively. The enrollment in the operation phase would decline to 19 percent below capacity in Duluth and 15 percent in Superior, with student to teacher ratios of 22 and 19 respectively.

The hospitals in the primary study area have a sufficient number of beds to support the influx of population. During the construction phases, Duluth's three hospitals would provide 11.2 beds per 1000 residents and Superior's Memorial Hospital would provide 5.8 beds per 1000 residents. These ratios would increase to 11.5 per 1000 and 5.9 per 1000 during the operation phase for Duluth and Superior, respectively.

The increase in occupied residences would not significantly impact the levels of protection provided by both Duluth's and Superior's police and fire departments. The ratio of full time law enforcement officers would slightly increase to 1.5 for Duluth and 2.1 in Superior during the construction phase and to 1.6 for Duluth and 2.2 in Superior in the operation phase. The fire department would continue providing about the same adequate level of service to their communities due to the decrease in the number of residents.

Due to the anticipated decrease in population from the 1985 estimates, water supply, wastewater, solid waste, and recreation facilities would not be significantly affected. Duluth's Lakewood Pumping Station is designed to supply up to 46 percent more water to the city and Superior's booster pump is designed for 28 percent more water, so additional residences and businesses may be accommodated. The wastewater treatment plant could handle 19 percent and 33 percent more wastewater in Duluth and Superior, respectively. The Rice Lake and Wisconsin Point landfills would be able to accommodate the increase in solid waste. The primary study area's parkland and cultural attractions would also be able to serve a greater population, with no appreciable decrease in the quality of services.

5.9.2 Impacts of the Fully Permitted Action

The effects of the fully permitted action on the economic and social conditions in the Duluth area would be the same as those for the proposed action.

5.9.3 Mitigation

Relocation assistance would be provided to tenants and homeowners residing in the proposed project area, as described in the housing discussion in Section 5.9.1. It is not expected that the population influx of relocating construction and operation workers would cause any impacts to occur in the Duluth area that would require mitigation.

The projected influx of 841 people into Duluth and 420 into Superior during the construction phase would serve to replace some of the estimated population loss of recent years, although not all of these workers and family members would be expected to become permanent residents. Analysis of the supply of available housing and the capacity levels of community facilities and services shows that a large number of new individuals can locate in the cities of Duluth and Superior without overburdening available resources. It is expected that assistance in locating preferred housing will be needed, however, as construction workers may desire housing for a relatively short period of time. Additional school teachers may also need to be hired to accommodate the larger number of students caused by the influx of construction worker's families.

If other large construction projects were to occur in the metropolitan area at the same time as the proposed project, the cumulative impacts would be larger and more mitigation efforts may be required. Other projects in the Duluth region that are scheduled for construction during the second half of the 1980's include ongoing highway construction projects, the Duluth Area Convention Center slated for 1986, and the Blandin Mill expansion in Grand Rapids, Minnesota slated for late 1986 or 1987. None of these projects are similar in magnitude to the proposed project and; therefore, are not expected to significantly affect the available labor pool.

Any mitigation required for the fully permitted action would be the same as that for the proposed action.

5.9.4 No Action Alternative

The no action alternative would consist of not developing the proposed project in Duluth. The present economic and social conditions would remain unchanged. If the papermill is not built, the population influx resulting from the increase in construction, operation, and service sector employment that would be associated with the project would not occur. The influx due to the construction and operation phases is expected to account for only 25 percent of the project's total labor force. The influx due to the service sector is only anticipated to comprise 22.5 percent during the construction phase and 10.7 percent during the operation phase of the total service sector labor force. The remaining portion of the labor force is expected to be obtained from the local labor pool.

Under the no action alternative, the region's depressed economy would not experience the beneficial effects that the proposed project offers. These benefits include direct employment opportunities, workers' wages and salaries, various purchases of materials and services by the project, and

secondary employment opportunities. Unemployment (and possibly underemployment) of workers is quite high in this region and the proposed project is expected to help improve this situation.

There would be no need for the City of Duluth to relocate the residents who currently live in the project site area without the project. In addition, there would not be any influx of new workers, who could also take advantage of the increasing number of available housing units in the areas. The level of community services provided without the project would not be very different from the level of services associated with the project. On the whole, the community services and facilities in the primary study area are able to handle a greater number of residents than the number that they presently serve.

5.9 REFERENCES

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5.10 TIMBER HARVESTING

The proposed papermill and the reactivation of the Hibbard Station will affect timber resources in Minnesota and Wisconsin. Both beneficial and adverse impacts will result from the project's need for timber resources. These are described for the proposed action as well as for the fully permitted action.

5.10.1 Impacts of the Proposed Action

Timber harvesting resulting from the proposed action is expected to have a number of impacts. The areas of potential impact include surplus timber supplies, as well as economic and environmental effects.

5.10.1.1 Surplus Timber

The project is presently scheduled to use 231,000 cords of balsam fir, spruce, and birch per year. Approximately 115,000 cords will be balsam, 56,000 spruce, and 60,000 cords birch. Aspen will eventually replace spruce in the wood mix. It has been estimated that about 25 percent of the balsam fir and aspen (when used) and 10 percent of the spruce will come from Wisconsin (Prosek, 1985). It is unlikely that any birch will be acquired from Wisconsin. Thus, utilizing this data and the surplus calculated for each species (Section 4.10), it is possible to determine how much of the surplus for each species will be used in each state. Within Minnesota, an estimate of 40, 50, 11, and 16 percent of the surplus balsam, spruce, aspen, and birch would be used, respectively. However, the value for aspen may well be 15 percent, based on the fact that there appears to be no surplus aspen in Wisconsin. It should also be noted that the percentage figure for aspen (assuming all is acquired in Minnesota) may actually be 12 percent when one considers that the 1983 figures of surplus aspen can be raised by 110,000 cords based on the plant closures discussed in Section 4.10. However, since aspen will not be used at all until 1990, the estimated surplus for this species could change considerably by that time.

Within Wisconsin, 25 percent of the balsam surplus would be used by the project, while 5 percent of the spruce would be used. Because birch will probably all come from Minnesota, none of Wisconsin's surplus will be used. As noted previously, there does not appear to be a surplus of aspen in Wisconsin at this time.

The cutting of surplus timber to meet project needs would produce potential benefits to the timber resources of northeastern Minnesota and northwestern Wisconsin. Cutting would help regenerate older stands, thereby making them more productive. Additionally, balsam fir regeneration could be managed to help reduce future damage from the spruce budworm.

5.10.1.2 Economic Effects

Project construction would add additional dollars beyond those of the initial capital investment to the economy of the area. The multiplier values presented below are for the pulp and paper industry as a whole and include values for timber harvesting, since the latter were not available separately. Multipliers were not available for the wood energy industry

although the use of birch as fuel would also be expected to have a positive impact on state and regional economies. It has been estimated that for each \$1.00 of stumpage value, \$24.93 and \$43.29 are created in wholesale product value and total economic activity, respectively (MDF, no date, a). In order to give an estimate of the value to Minnesota's economy, these multipliers can be used in conjunction with the number of cords of balsam fir and spruce (115,000 and 56,000 cords, respectively) which will be harvested initially by the project, and the stumpage value of each. Note that aspen will not be used initially in the wood mix. The average cost of balsam fir for 1984 was \$3.62 per cord on public lands and ranged from \$1.33 to \$8.06 depending on quality, distance from the mill, and method of sale (Ford, 1985). Values for spruce averaged \$12.69 per cord and ranged between \$4.00 and \$24.45. Stumpage costs tend to be higher on private lands. Using the above data for balsam, the project would create a wholesale product value of \$10.4 million and total economic activity in 1984 dollars of \$18.0 million. For spruce, the values are \$17.7 million and \$30.8 million, respectively. Thus, when considered together, the wholesale product value is \$28.1 million and the total economic activity is \$48.8 million. These values are based on the conditions and assumptions stated above and are only intended to give an indication of the total value added to the state. The value of birch as a fuel would be in addition to the figures given above.

An additional economic impact of the project with regard to timber harvesting is employment. Employment effects will be both direct (i.e., the number of persons involved in harvesting) and indirect (i.e., the number associated with other economic sectors). One estimate of the number of forest jobs created is related to the quantity of wood consumed, whereby one full-time equivalent logging position is produced for every 1710 cords per year of wood used (Ford, 1985). Thus, considering that the project will use 231,000 cords per year including wood for energy, a total of 135 new jobs could be created. However, because some logging operations are not functioning at 100 percent efficiency, the actual number of jobs could be less. In order to determine the full effect on employment, a multiplier of 0.9 can be used (Ford, 1985). This multiplier applies specifically to jobs in logging and not to the broader category of pulp, paper, and allied products, the latter value being 2.5 (MDF, no date, b). Utilizing the 0.9 multiplier and 135 new logging employees, one can calculate that 122 additional jobs will be created outside of the logging industry. Thus, timber operations associated with the project have the potential to create 257 additional jobs. Some of these jobs, however, will be in Wisconsin and the various multipliers used above may not be the same. Assuming that they are at least similar, and that 75 percent of the balsam, 90 percent of the spruce, and 100 percent of the birch come from Minnesota (Prosek, 1985), the jobs may be proportioned between the states. Thus, approximately 115 logging jobs and 104 spin-off jobs would likely be generated in Minnesota, and 20 logging jobs and 18 spin-off jobs would be generated in Wisconsin.

5.10.1.3 Environmental Impacts

There are a number of environmental impacts that could result from timber harvesting operations associated with the project. These include adverse impacts to streams and soils, aesthetic impacts, and effects on wildlife, including endangered and threatened species. These topics are briefly discussed in the following sections. These discussions are of a general nature

since the exact areas and methods of harvesting are not known. Those impacts that do occur will not be unique to the project and, assuming standard logging practices are followed, should be no worse or better than those resulting from other large scale harvesting operations.

Streams and Soils

Since clear cutting is the basic method by which wood will be harvested for the project, the potential exists to adversely impact streams in a number of ways. Clear cutting results in the removal of all trees and maximum disturbance to the understory and soil. As a result, the soil is exposed to increased levels of erosion which could subsequently lead to increased sedimentation of streams. Additionally, increased runoff can lead to short-term high volume flows. If cutting occurs along a stream bank, the stream will also be exposed to increased levels of light.

As a result of increased sedimentation, flow, and light, a number of potentially adverse impacts on aquatic organisms are possible. Increased sedimentation can lead to clogged gills and direct mortality, but may more likely cause decreased egg and larval survival if cutting takes place during the spawning season. Organic matter may also increase; this could result in changes to aquatic biotic communities. With increased levels of organic matter, changes in pH are also possible depending on the buffering capacity of the waterbody. Increased light may result in higher water temperatures which could impact fish and cause changes in phytoplankton communities.

The impacts described above would generally last only a season or two. With the growth of terrestrial vegetation, erosion and sedimentation could be expected to decrease. This would result in a subsequent decrease in adverse impacts to aquatic organisms. A somewhat longer period may be required before banks become shaded. In addition, soils within the general region from which timber would be harvested are often quite permeable, thereby reducing the potential for erosion (Harper, 1985). A study (Minnesota 208 Plan) has been made of nonpoint source pollution related to forestry practices. This study concluded that water pollution is generally not severe in forested areas; however, when water pollution does occur from forestry activities it is likely to harm a high-quality environment (MDF, 1982).

Another potential problem related to soils is its compaction during logging operations. Spruce and balsam would largely be cut during the winter months, thereby reducing this impact. However, to the extent that any of the species is cut during the warm months, soil compaction would be a problem. This problem would manifest itself in the form of problems with regeneration, such as the sprouting of aspen (Harper, 1985).

Aesthetics

Clear cutting causes a drastic change in the landscape, and therefore, has a direct impact on aesthetic qualities of an area. The attitudes of property owners and forest recreationalists with respect to this harvesting technique were surveyed in a Michigan study (Bennett et al., 1980). Within Michigan, quarter sections were clear cut at levels of 25, 50, and 75 percent in connection with a deer management program. About 44 percent of the property

owners agreed with cutting, 26 percent were undecided, and 30 percent disagreed. Predominant beliefs of these property owners were that much of the wood was wasted by not using slash, that cutting of oaks and pines was not acceptable, and that vegetation regenerated quickly after cutting. Attitudes were not dependent on education level, occupation, length of property ownership, or age of property owner; however, females were more opposed to clear cutting than males. The study also found that increased levels of cutting did not cause more people to notice the cut area. A constant 78 percent indicated that they saw cuttings on state land regardless of the amount cut.

A majority, 79 percent of forest recreationalists, other than deer firearms hunters (e.g., small game hunters, snowmobilers, trailbikers, hikers, blueberry pickers), said they saw clear cutting on the research areas. However, users still reported high ratings of enjoyment: 50 percent very good, 37 percent good, 11 percent average, 2 percent poor, and 0 percent very poor (Bennett et al., 1980). The attitude of persons in northeastern Minnesota and northwestern Wisconsin may or may not be similar to those of persons contacted during the Michigan study.

Wildlife

Clear cutting can be expected to have both immediate and long-term impacts on wildlife populations. Immediate impacts involve the direct loss of non-mobile species such as amphibians and reptiles, as well as other species, such as squirrels, which could be killed during tree felling operations. Clear cutting also represents a sudden and drastic change in the available habitat of an area. This can result in the movement of animals out of the clear cut area into adjacent unaffected areas. The success of the species in establishing themselves would be dependent on whether the areas into which they move are at or below carrying capacity. Larger mammals which require extensive unbroken tracks of forest lands could also be adversely impacted by opening up the forest cover within a region.

The new open habitat created by clear cutting would be expected to be attractive to a variety of species. Further, as the stand regenerates, it could be expected to be used by a number of important species, including deer and grouse. These two species are important game animals in both Minnesota and Wisconsin and habitat conditions favorable for them have also been found to benefit a wide variety of other species. In fact, forestry/wildlife guidelines developed for Minnesota's northern forests are directly aimed at these two animals with the understanding that many other species will benefit as well (MDNR, 1982); these guidelines are discussed in more detail in Section 5.10.3.

5.10.2 Impacts of the Fully Permitted Action

The fully permitted action would result in increased harvesting of birch timber for fuel. Potential effects include impact on surplus timber, economic effects, and environmental impacts.

5.10.2.1 Surplus Timber

Since the volume of wood to be used by the proposed papermill will not change under the fully permitted action, the percentage of the balsam fir, spruce, and aspen surplus to be harvested in Minnesota and Wisconsin will remain the same as under the proposed action. The volume of birch to be used at the Hibbard Station will, however, increase. This change would result in a greater percentage of the surplus birch being harvested in Minnesota.

5.10.2.2 Economic Effects

Since the volume of wood used in the papermill remains unchanged for the fully permitted action, the calculated values for wholesale product value and total economic activity remain the same as for the proposed action. These values are \$28.1 million and \$48.8 million, respectively. Under the fully permitted action, the volume of birch used as fuel at the Hibbard Station will increase over the 60,000 cords per year slated for the proposed action. This will result in an increase in both direct and indirect employment. Some of the new employment created by using additional cords of birch could occur in Wisconsin.

5.10.2.3 Environmental Impacts

Environmental impacts associated with the fully permitted action would be expected to be similar to those discussed for the proposed action, although they would likely take place over a larger area because of the increased use of birch. An estimate of the acreage involved is not possible, however, since the volume of timber varies from site to site and the location of the areas to be cut are not known.

5.10.3 Mitigation

There are a number of measures which can be taken to lessen potential environmental impacts resulting from timber harvesting. With respect to streams and soils, mitigation could include not permitting clear cutting to take place near lakes or streams. In fact, such cutting will not be permitted within shore impact zones when revisions are made to the state shoreland regulations (Harper, 1985). Cutting can also be limited on slopes, thereby decreasing erosion and sedimentation. To reduce soil compaction, a number of alternative mitigation measures are possible (Hargrave, 1985). These include limiting logging on the most sensitive sites to the winter, monitoring rainfall and halting operations when the ground is saturated, setting up a skid trail system to minimize the area compacted, and using equipment with oversized tires or tracks.

Certain actions may also be taken to lessen aesthetic impacts. These might include avoiding cuts near streams and lake shores, leaving a buffer strip along highways, and avoiding cuts on hillsides readily seen by large numbers of people (e.g., near a major highway). Such actions would tend to lower the opportunity for viewing clear cut areas.

To protect wildlife, the Minnesota forestry/wildlife guidelines were developed to ensure that state administered forest lands would be managed in a manner that is compatible with multiple-use goals (MDNR, 1980). These guidelines provide that the Wildlife Division be consulted when cuts are made on state lands. Beyond the general guidelines aimed at forestry/wildlife integration, specific guidelines have been developed for aspen, birch, and spruce-fir forests. These set forth recommendations to ensure that the value of each forest type to wildlife is maintained. The guidelines also contain a section which addresses special species, including certain endangered species. For example, where an active bald eagle nest site is identified, and specific management plans have not been prepared by the District Forester and Wildlife Manager, a number of temporary guidelines have been developed which restrict activities near the nest site.

Wisconsin has also recognized the interrelationship of forests and wildlife and the need to identify and protect critical forest types and stands through the coordination of forestry and wildlife management objectives (WDNR, 1981a). In addition, specific guidelines have been developed in relation to such important topics as forest openings and deer yards (WDNR, 1978 and 1981b).

When timber harvests associated with the project are on state lands, the guidelines discussed above will act to mitigate adverse impacts to wildlife; they should in many cases result in enhanced habitat quality for many species, including deer and grouse. The guidelines do not apply to private and other non-state administered lands and the benefits of forestry/wildlife coordination may not occur.

Resource management objectives are addressed in the proposed land and resource management plans for both the Superior and Chippewa National Forests in Minnesota (USFS, 1984a,b). These plans address specific limitations on forest management practices including identification of mitigation measures for each ecological unit within the forests. They apply to water and soil management and include visual resource objectives to reduce visual impacts from forest activities. Similarly, wildlife habitat objectives are included with a goal of maintaining viable populations of all existing species.

Under the fully permitted action, the harvesting of additional birch timber would not result in any additional unique impacts. Thus, the mitigation measures applicable to the proposed action are also applicable to the fully permitted action.

5.10.4 No Action Alternative

Additional timber would not be harvested under the no action alternative. Thus, surplus volumes of balsam fir, spruce, aspen, and birch would remain unchanged in Minnesota and Wisconsin.

Not building the proposed mill or reactivating the Hibbard Station would result in a loss of \$28.1 million in wholesale product value and \$48.8 million in total economic activity within the pulp and paper sector.

Additionally, the direct and indirect increase in employment predicted for Minnesota, 115 and 104 jobs, respectively, and Wisconsin, 20 and 18 jobs, respectively, would not occur.

The direct adverse impacts of logging on streams and soils, aesthetics, and wildlife would not take place under the no action alternative. However, certain beneficial impacts would also not occur. For example, some of the timber resource in northeastern Minnesota and northwestern Wisconsin is either overmature or nearly so. The cutting of timber for the project would act to help regenerate these stands. Without the project, this stand rotation would occur at a slower rate. Additionally, beneficial effects of harvesting balsam fir with for controlling the spruce budworm would not take place. Clear cutting also has the potential to benefit certain species of wildlife (e.g., deer and grouse), especially when cuts are coordinated with state wildlife programs. Any potential increases in deer or grouse populations resulting from harvesting would not take place under the no action alternative.

5.10 References

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